SCIENTIFIC AMERICAN

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A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

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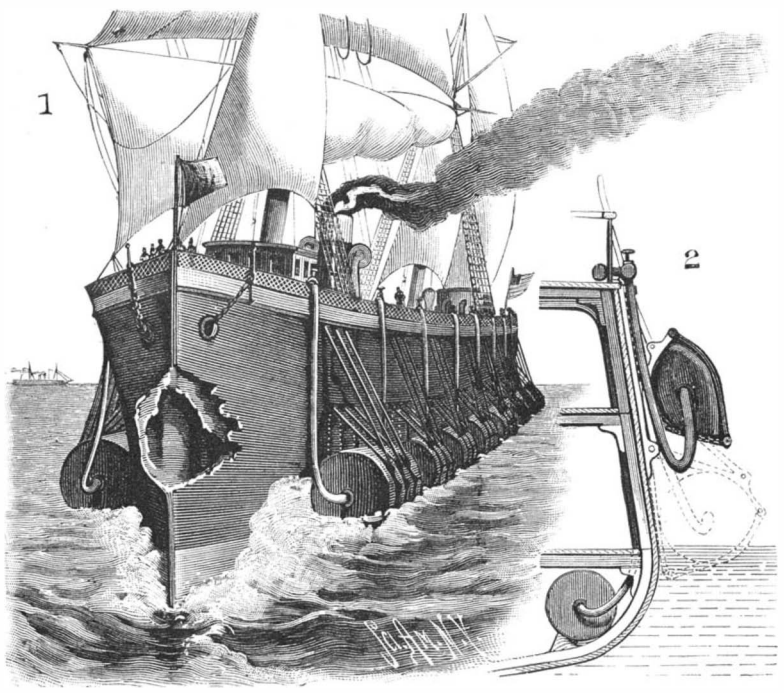
IMPROVED MEANS FOR BUOYING UP VESSELS.

A novel system of buoying up vessels by means of collapsible buoys attached thereto, and connected with a compressed air or other gas supply on the vessel, whereby the buoys may be inflated when needed, is illustrated herewith, and has been patented by Mr. B. D. T. Travis, of Burlington, N. J. Along both sides of the vessel, exteriorly and interiorly, are arranged buoys of rubber or similar material, connected by flexible branch pipes to a common main pipe, the main pipes being all connected to a common receiver, to be supplied with air under pressure by means of an air pump operated by a steam or other motor. All the pipes leading into the receiver have valves whereby the distribution of the compressed air may be controlled by a single person, so as to inflate such of the series of buoys as may be desired, and each branch pipe communicating with an outside buoy has a valve by which it may be cut out of the circuit in case such buoy is disabled. Over each outside buoy is a curved cap, and a hinged curved shield protects the under side of each buoy when inflated, being connected to the cap by a chain, and the collapsed buoy, when emptied of air, is closely embraced between the cap and the shield folded upon it. The buoy caps are hinged on the lower ends of hangers hinged on the ship's sides, or on knees, the hangers being fastened low down on the ship's side. The braces are caught by locks on the upper part of the hangers, and so remain fixed when the buoy is lifted against the side of the vessel, or high above deck, as demanded when in port. By this plan of lifting the buoys they can be readily removed from any point where they would interfere with the work aboard ship. When the buoys are lifted up, they can also be turned to catch the wind and aid the speed of the ship.



TRAVIS' DEVICES FOR BUOYING UP VESSELS.

THERE are 621 newspapers printed in Berlin. Fifty-four are official papers, 70 political, 165 have to do with literature, science, and art, 217 are commercial, and 30 religious.

A REMARKABLE RAFT.

On the 11th of August, after a voyage of eleven days, distance 700 miles, there arrived in New York harbor, from Nova Scotia, a timber raft of gigantic proportions, remarkable in being the largest of the kind that ever made a successful sea voyage. Several months ago an attempt was made to tow a similar structure to this city, but it was broken up and scattered by a storm upon the ocean. This second effort met with no serious obstacles.

This great float was called the "Joggins Raft," after the Joggins—a jog in the Bay of Fundy—famous to scientists the world over. For a distance of four miles along its shore, says the *Home Journal* (Gardner, Me.), is the most wonderful exhibition of the carboniferous period of the world's formation known in America.

The Joggins shore is on the eastern side of Cumberland basin, called by the old French settlers Beaubasin, or beautiful basin. The whole of this shore is a coal and stone mining region, thickly covered with thin, tall trees, which are in great demand in Boston and New York for piling. Twenty miles down the shore a low cove forms the mouth of a valley, flanked on either side by two high hills. In this cove the great raft was built.

The annual shipment of over 100,000 piles from this region of country, in two hundred or more vessels, suggested to Hugh R. Robertson, of St. John, the idea of towing 20,000 at a time in a monster raft. The idea was not original. It was first attempted from Quebec half a century ago, but failed. Two years ago Mr. Robertson patented his

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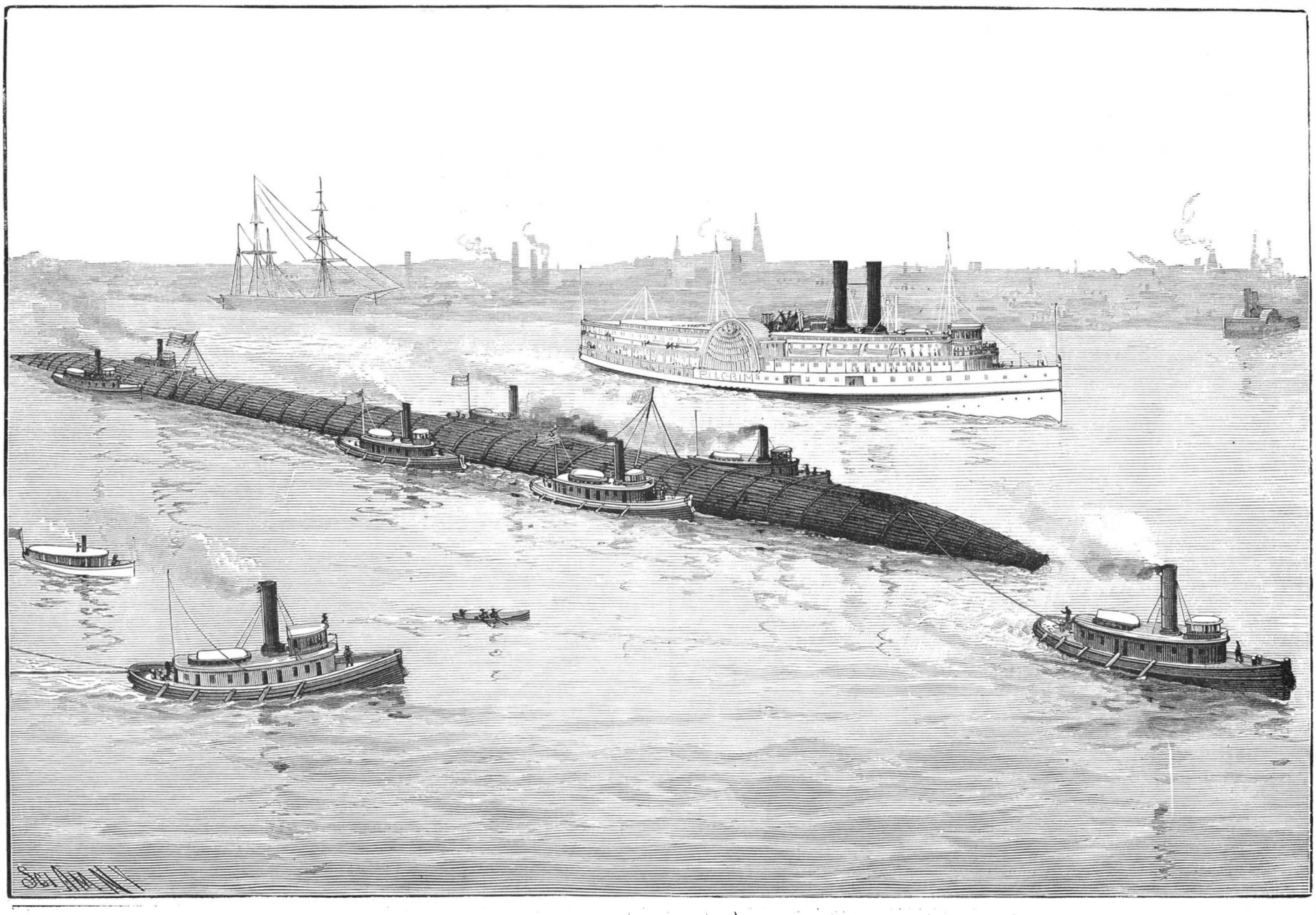

THE GREAT TIMBER RAFT FROM JOGGINS, NOVA SCOTIA.

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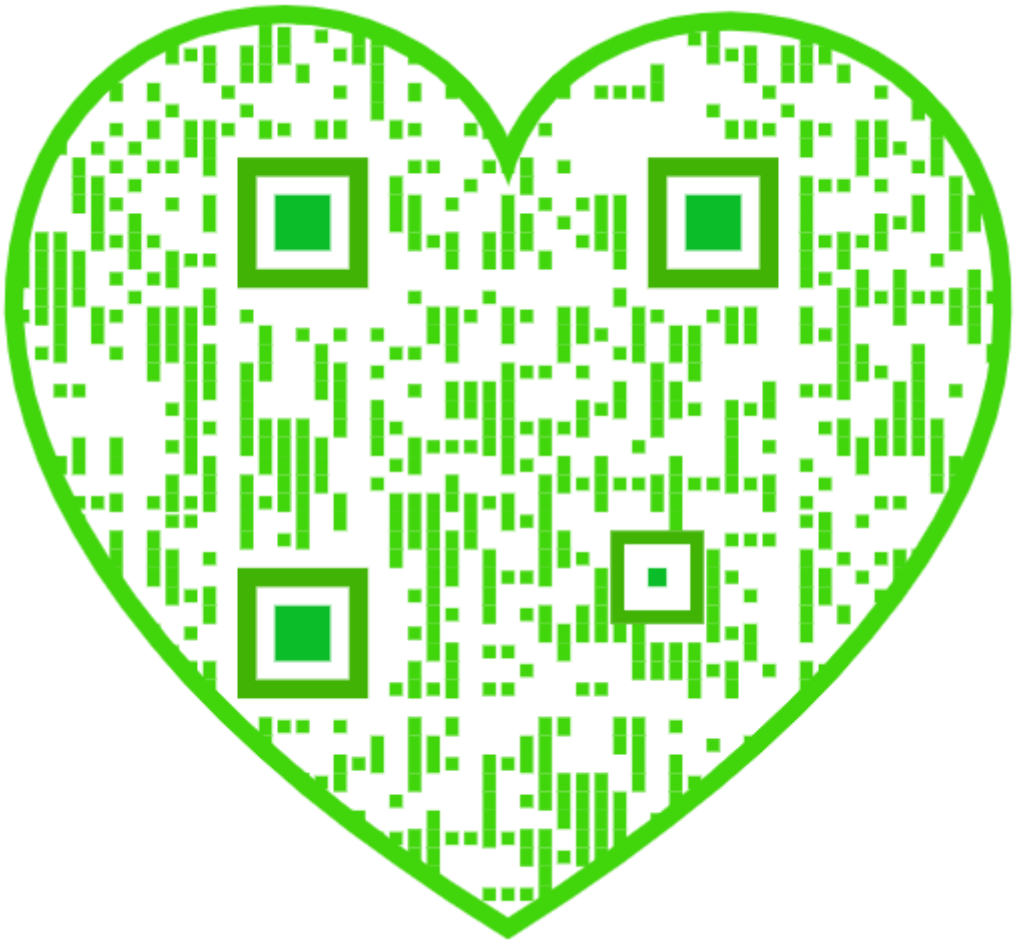

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YELLOW FEVER IN FLORIDA.

During the month of August much alarm has existed in Florida, on account of the appearance there of yellow fever. Many deaths have occurred in the smaller towns of the peninsula, but Jacksonville has been the principal seat of war in the battle between health and disease. Daily bulletins have been received from it for the last twenty days and have shown some fluctuations in the number of cases and deaths, but on the whole a pretty constant number of new cases have been reported.

Every means was adopted to check the speed of the fever. Resin and tar fires were built and maintained, in the hopes that the bituminous fumes would kill the bacterial germs. Acting on the theory that concussion of the air would effect the same result, cannonading was extensively practiced. Elaborate quarantine arrangements were established, passengers' baggage on the railroads if suspected was detained and fumigated. Camps were established for refugees. A sadder form of precaution was the pickets. Outlying lines were guarded by armed men for the exclusion of fugitives from infected districts. On August 20, five new cases were reported at Jacksonville and one death, giving a total to date of thirty-eight cases and six deaths. At present the threatened plague is diminishing, and a few more days will, it is to be hoped, witness its end, before the evil reached any degree of magnitude.

THE GREAT AUGUST STORM.

During the week ending August 21st, the United States were visited by a severe wind and rain storm which may fairly rank among the greatest storms of the year. It began on Monday, Texas and the adjoining territory being the starting point. Thence it moved on in a northeasterly direction, its center reaching Memphis, Tenn., at 8 o'clock that evening; twelve hours later it reached Louisville, Ky.; and twelve hours more brought it to New York. A low barometer prevailed along its course, 29·46 being the Memphis and Louisville readings at the periods when the storm center passed over them. On its way to New York the storm passed through the Ohio Valley, and even reached the Great Lakes and the St. Lawrence River.

In the neighborhood of the Gulf of Mexico the high water on the rivers and coast did much damage. The plantations about the mouth of the Mississippi were inundated, a large portion of New Orleans was flooded, many washouts were caused on the railroads, and a great number of coal barges were sunk. Elsewhere similar occurrences are reported, a vast extent of country being inundated along the course of the storm.

In this city the wind reached the rate of thirty-six miles an hour, and in eighteen hours of August 21st the rainfall amounted to 3·30 inches. In some respects it ranks as the most severe storm of the year.

THE ELECTRIC LIGHTING CONVENTION.

The National Electric Light Association, which met here last week, is much increased in membership since last year, the attendance itself showing it. The papers, for the most part, were upon practical topics, explaining just how certain obstacles may be removed; some were on theoretical problems, and some cited experiences extremely valuable to others, though costly to those who conducted them; for it is always instructive to a practical man to be told how a certain result may not be obtained, and the reason why.

Some of the principal papers read were: Electrical Steam Engineering, by W. L. Church; Some Practical Pointers, by C. C. Haskins; Measurements of Alternating Currents for Commercial Purposes, by O. B. Shellenberger; The Ideal Motor, by F. B. Crocker; Disruptive Discharges of Underground Conductors; Electrical Conductors in New York City, by S. S. Wheeler.

It is an interesting and instructive study to note the growth of this association and the conditions surrounding it. We can all remember when the telephone appeared and startled us. It was so novel that it was hard to understand how it could be made of practical value, especially as, at that time, with the apparatus at hand, it did not work so smoothly and reliably as now. Practical, pushing men got hold of it, and now we wonder how we could get along without it. The case of the electric light has been, in many respects, similar. Who would begin to distribute it? Who would be the first to use it? Projectors delayed, as if to give each other a chance to spend a pot of money in experimenting. It was only a short time, however, when a system was devised for both the voltaic arc light and the incandescence. Some projectors came out boldly and put their money in lighting plants, while others, not yet sure, showed an inclination to make the apparatus and let others do the lighting, until finally there came to be no more doubt about there being money in selling the light as well as the plant. Naturally enough, with a great field full of ingenious, practical electricians, the first crude attempts at general distribution were improved on over and over again, and this improvement has never known a pause. It is going on now even faster than when it first started, one improvement following another so quickly, it treads upon its heels.

One of the most difficult problems before the officers of the association was how to get men who had succeeded in making improvements to come to the conventions and explain them. They were slow to do this, hard to be convinced that it was to their interest to do so; for that they would, like enough, carry away with them in exchange the equally valuable discoveries that had been made by others in other directions. It has been in this way, by urging men working in the same field to exchange ideas with mutual advantage, that the management have succeeded in bringing the National Electric Light Association to its present satisfactory position and awakening so much interest in its proceedings. That the theory they worked on was a good one is amply proved by the attendance and the fact that every big lighting company in the country sends a representative to its meetings; those who have come to the earlier meetings and explained their experiments in the way of removing obstacles, appearing again and again to repeat the same thing, and listen to what others have been doing in the same line.

MEETING OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The American Association for the Advancement of Science began its annual meeting at Cleveland, O., on August 15. The usual address of welcome on the part of the city was responded to by Major J. W. Powell, the president of the Association. The retiring president, Prof. S. P. Langley, gave his address on the subject of the History of a Scientific Doctrine. The meeting then lasted until the close of the week. It was marked, as usual, by receptions to the Association on the part of the citizens of the place of meeting, and by evening lectures by members. Prof. Putnam, the permanent secretary, reported an excellent financial status. The permanent endowment fund exceeds $45,000, and the liabilities are nominal.

In the chemical section, Profs. Maybery's and Dow's paper on the Salt Brines in Northern Ohio was of special interest. They found bromine and lithium in the brines from natural gas wells in quantities sufficient to indicate a commercial value for this product. In the biological section, Dr. E. Lewis Sturtevant read a paper on a Phase of Evolution. It was a study of the dandelion and of its apparent modifications under cultivation. He advanced the view that cultivation does not cause new variations, but only takes advantage of those already existing.

The ever interesting subject of gravitation was treated in a paper by Prof. Erasmus D. Preston, entitled Deflections of the Plumb Line and Variations of Gravity in the Hawaiian Islands.

Prof. Atwater gave one of his striking monographs on the subject of plant food, stating that it might yet be practicable to raise crops in water, the food elements being supplied thereto by the cultivator. He cited a buckwheat plant thus raised, producing about 800 perfect and 200 imperfect seeds.

Transisthmian canals were discussed by Mr. W. Nelson, who spoke of the Panama Canal as it is, while Lieutenant Peary and Commander Henry T. Taylor told of the progress made on the Nicaragua Canal. The probable cost is now put at fifty or fifty-five millions of dollars.

After the election of officers for the next year, Prof. Mendenhall being elected president, the meeting adjourned.

Cholera and its Effects in Sicily.

The British consul at Palermo, in his last report, observes that business during last year suffered greatly from an epidemic of cholera in Sicily, the mortality being very great in most of the towns. The population of Palermo lived for some months in a state of "savage panic." The effects were heightened by the ignorance and superstitious character of the people generally. In the poorer quarters it was believed, as in the Middle Ages, that the government and the richer classes were disseminators of the cholera poison, in order to exterminate the poorer population. Sisters of charity were stoned in their visits to the houses of choleraic patients, and even doctors were sometimes obliged to visit the sick under military escort. A man with a decent coat on his back always walked in danger of being assaulted, since it was believed that all were agents in a conspiracy for the extirpation of the poor. In interior towns tragic scenes ensued in consequence of this superstition. "The popular mind in Sicily seems inaccessible to any idea of the virtue of clean water and soap," and sanitation has been so completely neglected that it may be doubted whether cholera has not become endemic. For a time Messina became a veritable desert; many of the chief medical men fled, as well as numerous apothecaries; every house was closed and food was most difficult to procure, and what was obtainable was of the very worst quality. The mortality was almost entirely confined to the humbler classes, all who could leave the city having fled.

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POSITION OF THE PLANETS FOR SEPTEMBER.

JUPITER

is evening star, and once more wins the place of honor on the planetary annals, but, after September closes, his best period of visibility has passed. The prince of planets may be easily found in the southwest, setting on the 1st about 3 h. after the sun. He is in conjunction with Mars on the 11th, at 9 h A. M., being 2° 12′ north. The planets will be near neighbors on the evening of the 10th. He is in conjunction—for the third time during the present year—with Beta Scorpii on the 22d, at 8 h. P. M., being 28′ south, planet and star setting about 30 m. after the conjunction. Jupiter sets on the 1st at 9 h. 45 m. P. M. On the 30th, he sets at 8 h. 4 m. P. M. His diameter on the 1st is 34″.8, and he is in the constellation Scorpio.

MARS

is evening star and his course through the month is one of special interest. Moving at a more rapid pace, the ruddy planet overtakes and passes his more lordly neighbor on the 11th, as already stated. He is in conjunction with Beta Scorpii on the 13th, being 2° 34′ south, and in conjunction with Antares on the 22d, being 3° north. A good opera glass will be a valuable aid in the observation of these celestial meetings and partings. Mars sets on the 1st at 9 h. 19 m. P. M. On the 30th, he sets at 8 h. 31 m. P. M. His diameter on the 1st is 7″.6, and he is in the constellation Libra.

MERCURY

is evening star, and takes an active part in the proceedings of the solar community during the month. Moving eastward in his rapid course, he overtakes Venus on the 18th, at 10 h. P. M., being 1° 39′ south. He is in conjunction with Uranus on the 19th at noonday, being 1° 28′ south. On the 22d, at 2 h. P. M., he is in conjunction with Spica, being 55′ north. Mercury sets on the 1st at 6 h. 49 m. P. M. On the 30th, he sets at 6 h. 20 m P. M. His diameter on the 1st is 4″.8, and he is in the constellation Leo.

VENUS

is evening star, and sets at the close of the month more than an hour after the sun. Observers will find the beautiful evening star in the southwest soon after the sun has disappeared. She makes a close conjunction with Uranus on the 19th, at 3 h. P. M., being 14′ north. Venus sets on the 1st at 7 h. 3 m. P. M. On the 30th, she sets at 6 h. 28 m. P. M. Her diameter on the 1st is 10″.4, and she is in the constellation Virgo.

URANUS

is evening star and is near Venus and Mercury on the 19th. Uranus sets on the 1st at 7 h. 49 m. P. M. On the 30th, he sets at 5 h. 59 m. P. M. His diameter on the 1st is 3″.4, and he is in the constellation Virgo.

SATURN

is morning star and the only visible planet in the morning sky. He is easily found in the northeast, rising 2 h. before the sun at the beginning of the month, and 4 h. before him at the close. Saturn rises on the 1st at 3 h. 10 m. A. M. On the 30th, he rises at 1 h. 32 m. A. M. His diameter on the 1st is 15″.6, and he is in the constellation Cancer.

NEPTUNE

is morning star. He rises on the 1st at 9 h. 58 m. P. M. On the 30th, he rises at 8 h. 4 m. P. M. His diameter on the 1st is 2″.6, and he is in the constellation Taurus.

Uranus, Mercury, Venus, Jupiter, and Mars are evening stars at the close of the month. Saturn and Neptune are morning stars.

Gas for Locomotives.

The Philadelphia *Record* says that the problem of obtaining a cheaper fuel than coal for locomotives, which has long bothered railroad men, seems likely to be solved soon by experiments now being made with gas. A very good test of the new fuel has been made at the works of the Electric Light Company, in West Chester, which, since the fire that destroyed the old plant several months ago, have been dependent for their motive power upon the Shaw locomotive. This is the engine that made such a good record in some trial trips two or three years ago, but which has never done much road service.

Instead of coal, gas mixed with air has been used in the locomotive with entire success in generating sufficient power to drive the dynamos. With larger machines for producing and mixing the gas, it is believed that power enough can be obtained for driving locomotives with trains, and a special car is now being built at New York to hold a large machine of the kind used in mixing the gas and the storage receivers. This will be attached to a locomotive, and tests will be made soon, probably on the main line of the Pennsylvania Railroad, or the short branch line from West Chester to Phœnixville. The experiments at West Chester have been made under the direction of Jackson Richards, who has recently been restored to his old position of master mechanic of the Reading Railroad's Norristown, Germantown, North Pennsylvania, and Bound Brook lines, and Mr. Richards is sanguine of the success of the new fuel. The gas and air are mixed in a machine called the Caloric King, the invention of Rev. Ballard S. Dunn. In a report upon its workings Mr. Richards says :

I am satisfied in my own mind that if machines large enough for locomotives are built, with a reserve power, it will be a great advantage and saving to burn gas as fuel for railroad purposes. Having some 30 odd years' experience in the construction and management of locomotives, I can speak with confidence on the subject. I claim, in the first place, that the saving in burning gas instead of coal will be very great ; for with the present system but about 45 per cent of the fuel is used, 55 per cent going to waste, while with Caloric King to commingle the gas and air the combustion is so perfect that nothing is lost. To illustrate my meaning it is only necessary to state the fact—well known to gas manufacturers—that one ton of coal will make about 11,000 feet of gas, which gas commingled with air and burnt through the Caloric King will do more railroad work than any two tons of coal, besides giving the company an additional profit from the sale of coke.

The next saving, resulting from taking off the back pressure, amounts to 20 per cent, while doing away with the disagreeable noise of the exhaust, adding this strength to the engine. Another advantage to railroad companies is the doing away with all smoke, soot and cinders, thus saving the heavy damages that companies annually pay for property destroyed along their lines.

Lobsters in the Pacific.

The United States Fish Commission lately sent off to California 600 live lobsters, 350 of which arrived safely at Sacramento. Several attempts had previously been made to send live lobsters across the North American continent, but had failed. In the present instance, as we learn from *Science*, Colonel McDonald, Fish Commissioner, personally superintended the packing of the lobsters. A crate or box devised by the late Captain Chester was used. This was placed within another larger box, the intervening space being filled with pounded ice. In the inner box the lobsters were placed between layers of rock weed, which at times was moistened with sea water. Each box had an independent drain, so that the fresh water from the melting ice could not enter the lobster box. The temperature of the latter was kept at 45° F.

A Fish Commission car was used, the boxes along the side of it serving as the outer box of the combination described above ; one hundred crates, each containing six lobsters, being placed in them, and surrounded with ice. Each morning before sunrise a careful inspection of the lobsters was made, and those that had died were removed. The first day 45 died ; the second day, 55. After that the mortality was much less. All of those that died were in an advanced state of shedding, and were in poor condition when they started. One-half of the 350 lobsters that arrived safely on the Pacific coast were placed in the ocean north of San Francisco, and the other half south. The condition of the water in that region is similar to that of the Atlantic off the Massachusetts coast. The temperature is about the same, but is more constant. The lobster on the Massachusetts coast crawls out into deep water in the summer, where the temperature is low, but it is thought that the equable temperature of the Pacific will enable the lobster in those waters to spend the whole year in one spot.

The Eggs of the Gnat.

In some notes on the development of the gnat, contributed by Mr. Harry Thomas to *Science Gossip*, the writer says : " The female gnat lays her eggs arranged spirally, in a sausage shaped colorless jelly, varying from one quarter inch to one inch in length, beneath the surface of still waters. I obtained specimens during the months of August, September, and the early part of October. They were found usually attached to the side of the vessel, by an adherent disk terminating a prolongation of their upper extremity just beneath the water, but sometimes unattached, suspended several inches beneath the water, when the disk reaches to and floats upon the surface. When first deposited, the eggs are closely packed together, forming a short, brown string. In a very short time the connecting envelope absorbs the surrounding water till it has increased to many times its original bulk. The eggs then become separated and form an inner spiral chain. Slightly magnified, the egg case appears divided into many equal segments by narrow transparent rings, and two transparent threads, twisted with each other, may be traced from the neighborhood of the lower to the upper extremity, where they unite and are continued beyond as a single thread terminating in an adhesive disk. The eggs appear somewhat oval in form, and are arranged in a spiral which shirks a complete turn, and when all but round, makes a loop and goes back again. The nearly completed rings thus formed lie each within a separate segment."

Evaporated Fruit.

Rochester is the recognized center of the evaporated and dried fruit industry of the United States, which during recent years has assumed very large proportions, the goods being shipped in large quantities to all of the leading markets of the world. No finer fruit is produced on this continent than is grown in the territory embraced under the name of Western New York, comprising some twelve of the most fertile and richest counties of the Empire State. The cultivation of fruit, especially apples, has superseded all other agricultural products, and has proved the most remunerative to the growers. The orchards of the farming community are the chief sources of their wealth, and the industry is prosecuted with unabated vigor, largely aided by the experience, skill, and resources of the great nurseries of Rochester, famed throughout the world. Whether due to this proximity, the favorite climate and soil, or the superior and skillful cultivation of the orchardists, one thing is certain, that the apples of Western New York are sought with avidity, and bring relatively higher prices than those grown in any other portion of the country.

The success and magnitude of the evaporation industry is due largely to the fine quality of the fruit, easily and cheaply procurable in abundant quantities, and also to the enterprise of the producers in adopting new and improved evaporators and machinery in place of the crude process in vogue years ago, producing thereby a quality of fruit fully as good and palatable to the sight and taste as though it were in the fresh or uninjured state. Thousands of tons of apples are produced every season from a quality of fruit heretofore wasted and allowed to rot on the ground, and which now forms a nice income to the grower. It is in the utilization of these waste products that the desiccation of fruit becomes a valuable and indispensable adjunct to every fruit grower, and the business may be considered as yet in its infancy.

Within a radius of forty miles of Rochester there are more than 1,500 evaporators, from the small farm house drier, of a capacity of twenty-five bushels a day, to the large steam evaporators, drying 800 to 1,000 bushels of apples each twenty-four hours. These evaporators give employment during the autumn and early winter months to at least 30,000 hands, who average from $5 to $12 a week, according to experience and usefulness. New factories are erected every season, proving that the business is profitable when properly and economically conducted. Constant care and scrupulous cleanliness are the first elements of success in evaporating good fruit. The production during the past season, 1887, may be well considered the largest since the inception of the business, some fifteen years ago. A careful estimate places the total quantity at about 30,000,000 pounds, worth at first cost some $2,000,000. To produce this quantity of apples is required 5,000,000 bushels of apples, 15,000 tons of anthracite coal, and the constant attendance, night and day, of an army of men, women, and children, numbering 25,000 to 30,000 The water eliminated in the process of evaporation amounted to 225,000 tons, reducing the bulk of the green fruit to about one-eighth of its original weight, each 100 pounds yielding when properly evaporated twelve pounds on an average. The fruit is usually packed in cases of two cubic feet measurement, holding fifty pounds net, the product of say eight and one-half bushels of green apples.

The advantages in freight alone will be apparent from the following comparison, showing the cost of shipping one case to Liverpool, England, which at existing freight rates will cost a little less than thirty cents, while in the green or fresh state in barrels the same quantity would cost $2.25, and in the canned state almost $2.10, without considering the deterioration of the green fruit and the dangers of fermentation to the canned article, the apple in the evaporated state being transported without any danger of deterioration or decay. The refuse of the apples, such as the parings and cores, are dried and form the base of all the cheap jellies manufactured at present. The quantity produced last season will aggregate some 12,000,000 pounds, so that not a particle of the fruit is wasted.

The principal consuming countries abroad are Germany, England, Belgium, Holland, and France, in which the new product has entirely displaced the old-fashioned sun-dried fruit. There were shipped alone to France during 1887 some 18,000 barrels of a quality known as chopped or sliced apple, which is dried without being either pared or cored, and is used chiefly for the production of cider, cheap wines, and distillation when the vineyards of France suffer from the phylloxera. Some 4,000,000 pounds were exported during the season, of which more than one-half were shipped from Rochester. New York State evaporated fruits have secured a very favorable reputation and strong foothold abroad, and can be had in almost any town or city of importance on the European continent. The goods are also taken in considerable and increasing quantities by the West African and Australian trade every season, and with the popularity and growing demand at home the success of the business is more than assured. —*Bradstreet's.*

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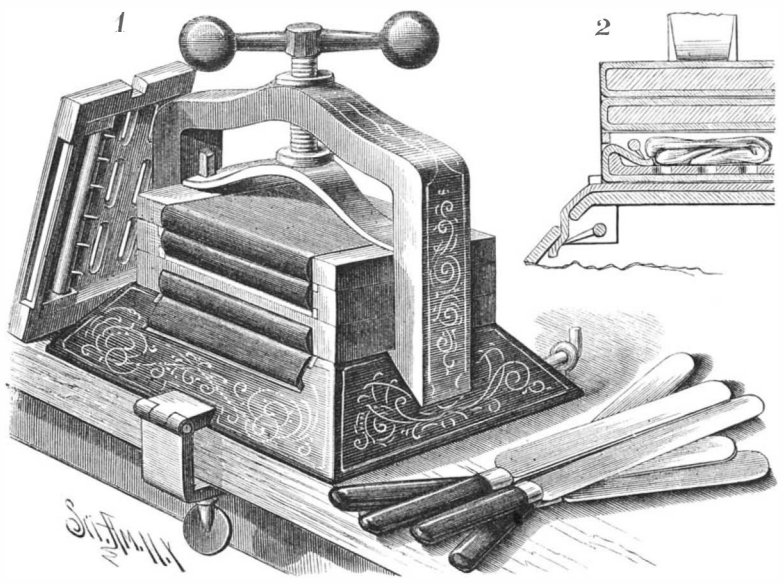
AN IMPROVED KNIFE CLEANER.

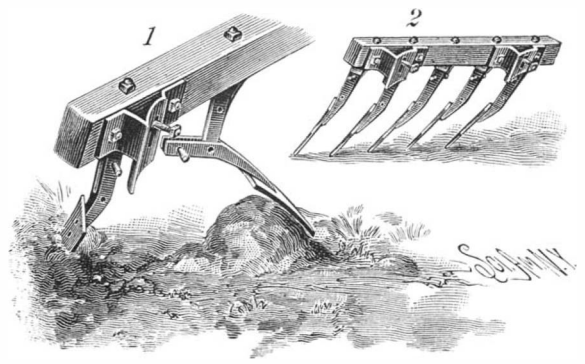
A simple and compact machine for cleaning and polishing the blades of table knives, cleaning them thoroughly on both sides and their back edges, and without strain on their handle fastenings, is illustrated herewith, and has been patented by Mr. Robert W. Jamieson, of Prince Albert, Saskatchewan, N. W. T., Canada. The machine has two pairs of rubbing blocks, a lower pair for cleaning and an upper pair for polishing, these blocks being faced with suitable fabric or leather coverings between which the cleaning and polishing powder is placed. The lower cleaning block is formed by the base of the machine frame, having a facing which extends down at each side, and is passed at opposite edges through slots where it is held by teeth on rods journaled at opposite ends of the base, as shown in Fig. 2. The upper cleaning block has similar toothed rods journaled in it, to hold a facing fabric to its lower face, there being in the floor of the block a series of slots or holes through which moisture held by a sponge may pass to wet or damp the facing fabrics and the knife brick or other cleaning powder placed between them. The upper polishing blocks are preferably made solid, and faced by suitable leathers cemented around them, but so that the blocks may be reversed as desired. Transverse shoulders are provided at opposite ends of the blocks for cleaning and polishing the back edges of the knife blades. All of the loose rubbing blocks are notched at opposite ends to fit ribs on the opposite uprights of the frame, and a spring, also notched to engage these ribs, is swiveled to the lower end of a screw threaded into the head of the frame, and having a handle bar, for regulating the pressure of the opposing pairs of cleaning and polishing blocks on the knife blades passed between them.



JAMIESON'S KNIFE CLEANER.

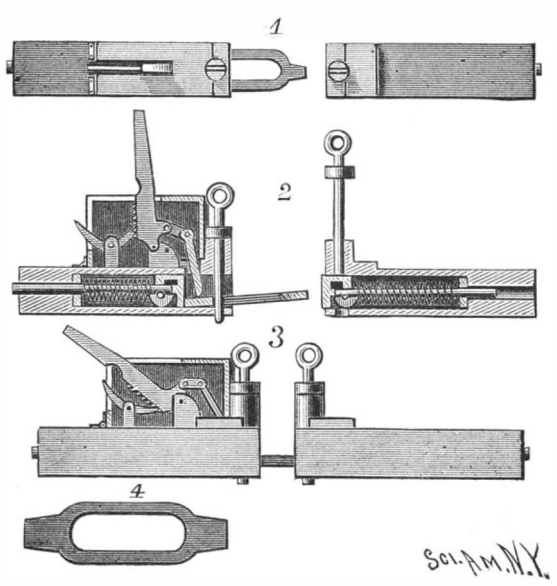
IMPROVED SETTING OF CULTIVATOR PLOW POINTS.

A simple attachment for any cultivator now in use, which is cheap and durable, and can be adjusted to throw dirt to or from corn, etc., and which will thoroughly pulverize the ground without making unnecessary work for the horses, is illustrated herewith, and has been patented by Mr. Thomas G. Tasker, of Onslow, Iowa. A notice of this invention appeared in our issue of Nov. 26, 1887, and the accompanying views



TASKER'S CULTIVATOR ATTACHMENT.

represent particularly the manner of attaching the cultivator head bar, carrying the plow points, to the cultivator beam, and the action of the safety pin, whereby the plow points are uninjured when a solid obstruction is struck. The cultivator head bar is secured to the ends of the beams by bolts passing through the beams and through angle plates secured to the rear surface of the bar, these plates being slotted and bent to form a breast piece and straight shoulders, the construction being such that the bar may be adjusted vertically at the points of connection to the beams, while the plate may be adjusted vertically on the bar.



CLARK'S CAR COUPLING.

With such attachment the plow points follow each other and are all permanently connected, so that the plowman can do better work.

An Ironclad Car.

Perhaps the only solid iron box car in the Southern States to-day is now in use regularly on the Nashville, Chattanooga & St. Louis Railroad. It was built by the United States government more than twenty years ago, and, judging from present appearances, it will be used for twenty years more. This relic is constructed of heavy boiler iron, with doors of the same material, and was used to transport powder and ammunition along the line of road between Nashville and the South to the Federal troops and stations. It afforded perfect safety to its contents from those terrors, the Tennessee bushwackers, who lay along the track and fired upon the occupants of every train. Their bullets fell harmlessly from the sides of the ironclad; so for four long years of strife and bloodshed this old traveling magazine would jog along calmly and serenely through the thickest of the fight, indifferent to all attacks that were made upon it. After following the army all over the South and fulfilling its important mission, at the close of the war it was sold to its present owners. It was used by them as a baggage car on the Shelbyville branch for about fifteen years. Since then it has had a checkered career, running as an extra baggage on the main line, as a freight car on the different branches, and at last it was placed on the Lebanon branch about three years ago, where it runs regularly at the present time. Could this old fellow speak, what an experience he could relate! It is, perhaps, the only relic of the kind in the country, and, its veteran friends say, in token of past services should be bought by the government and placed in the National Museum, where, doubtless, it would be a very attractive feature.—*Nashville American.*

AN IMPROVED CORN HUSKER.

A simple device by means of which the husk of corn can be easily and quickly torn from the ear has been patented by Mr. Theodor H. Mehring, of Niobrara, Neb., and is illustrated herewith. The device has jaws which open and close like shear blades, each of the jaws having concave sides, which, when closed, form a cup-like cavity, the meeting edges being cut away at the middle to form an aperture when the jaws are closed, as shown in Fig. 2. Each jaw has a row of short inwardly projecting teeth around the edge, as shown in Fig. 3, with a pointed prong on the outer end to guide the ears of corn into the space between the jaws. The jaws are not in the same plane with the handles, but at a considerable angle thereto, and the large side of the handle has a sharp-edged tooth to be used to cut the silky threads on the ears. The operator holds the husker with his right hand, with his left taking an ear of corn by the outer end, when he opens the jaws and passes the pointed ends over the stem of the ear until the inner end of the husk is inclosed by the jaws, so that the stem of the ear projects through the aperture. The jaws are then closed so that the teeth penetrate the husk, when, with a slight twist, the ear is freed from the husk by breaking the stem.

AN IMPROVED CAR COUPLING.

A coupling in which the pin and link are held in position to be coupled, and the pin automatically dropped into engagement with the link, has been patented by Mr. John M. Clark, of Hebron, N. Y., and is illustrated herewith, Figs. 2 and 3 being sectional views, Fig. 1 a plan view, and Fig. 4 showing the link. The hollow drawbars each contain a slide having a guide rod on which is mounted a coiled spring, the slide moving freely on a friction roller. The forward ends of the drawbars have each an upward projection, through which is a vertical aperture to receive the coupling pin, the slide being held by the action of the spring beneath this aperture, and supporting the coupling pin in raised position. To a bracket on the drawbar at the left is pivoted a lever held in position by a pawl, and connecting with a bar adapted to move through a slot and bear down upon the end of a link to tilt it into inclined position, as shown in Fig. 2, the bar held by the lever being also adapted to hold the slide to the rear of the vertical coupling pin aperture.

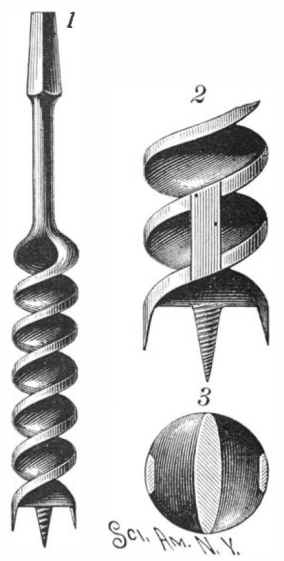
The lower edge of the bar held by the lever is beveled to take hold of the projection on the end of the link, so that, as the slide is pushed back by the link, and the coupling pin drops to position, the lever will be thrown up, and hold the link in position to be coupled automatically.

Purification of Mercury.

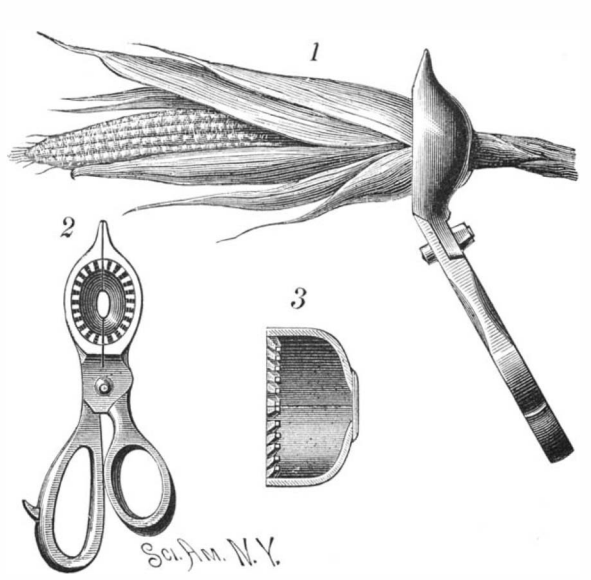
The author effects the purification by passing air through the mercury for forty-eight hours. The impurities, zinc, lead, tin, etc., collect at the top of the tube in the form of a black powder. The removal of traces of silver and gold is not necessary for mercury intended for filling barometers and similar instruments. These impurities do not affect the density of the mercury, nor alter the appearance of the meniscus. The author considers that if pure air has any oxidizing action upon pure mercury it is so slight as to be scarcely appreciable. Platinum in thin foil is not attacked by mercury in the cold, but on prolonged boiling the platinum is attacked, the greater part remaining in suspension as a black powder.—*J. M. Crafts.*

AN IMPROVED AUGER.

An auger which has one or more cutters so located that the boring will not be impeded, and the edges of the hole may be trimmed after the hole is made, has been patented by Mr. Harry W. Richards, of Eden, Florida, and is illustrated herewith, Fig. 1 showing a cutter extending from the shank of the auger, where the spiral terminates, to the edge of the spiral below and integral with the auger, and Fig. 2 showing a cutter extending from one edge of the spiral adjacent to the pod of the auger to the edge next above it. Fig. 3 being a horizontal section on the line thereof. The cutter is formed with vertical cutting edges operating in a horizontal plane, the height of the cutting edge being equal to one-half the diameter of the auger. Instead of being made integral with the auger bit, the cutters may be detachable, to be held to the auger by dovetailed joints and set screws. Only one cutter may be employed, or a number, and they may be located at any position on the auger between the pod and the shank of the auger. In operation, when a hole has been bored, the auger is pressed laterally against the side of the hole and rotated, the cutters trimming the edge and bottom of the hole. The auger is then drawn up and the edge of the top of the hole trimmed by the cutters adjacent to the shank, or the auger may be drawn up in the hole and the cutters adjacent to the pod operated in the same manner.



RICHARDS' AUGER.



MEHRING'S CORN HUSKER.

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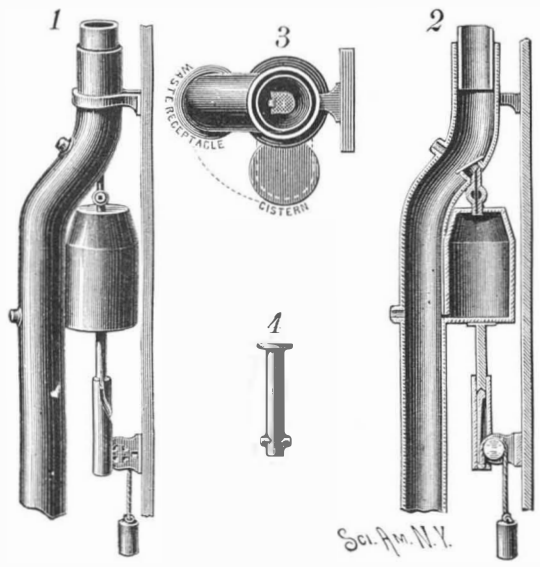
AN AUTOMATIC WATER TRAP FOR CISTERNS.

A water trap designed to assure the escape of the water first flowing from a roof at the commencement of a rain, the flow being after a brief interval directed to the cistern, is illustrated herewith, and has been pat-

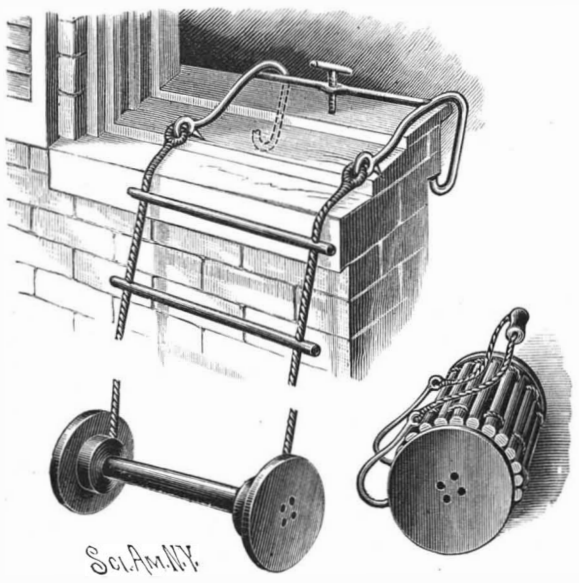


PICKERING'S WATER TRAP FOR CISTERNS.

ented by Mr. Charles H. Pickering, of Houston, Texas. The upper straight end of the main pipe, in which terminates the lower end of the leader, is guided in a bracket secured to the wall of the building, the main pipe having a bend, and thence continuing straight down, to connect at its lower end alternately with the waste receptacle and the cistern. On the side of the main pipe is secured a receptacle, as shown in Figs. 1 and 2, with a small aperture near its bottom communicating with the main pipe, and the top of the receptacle is connected by a pipe and an opening controlled by a valve with the bent portion of the main pipe, the top opening being covered by a hinged sieve or strainer. To the bottom of the receptacle attached to the main pipe is secured a pin extending into a sleeve rigidly connected with a bracket fastened on the lower end of the first bracket, and from the lower part of the pin project short pins, which engage a spiral groove formed in the sleeve, so that when the pin descends the spiral groove turns the pin on its axis about ninety degrees. In the sleeve is held to slide a pin engaging a recess in the bottom of the upper pin, and having a vertical slot into which projects a pulley mounted to rotate on the bracket, there passing over the pulley a rope secured by one end to the lower end of the pin, and the other end of the rope carrying a weight. As shown in Figs. 1 and 2, the receptacle at the side of the main pipe is empty, and the main pipe is held in its uppermost position by the weight, its lower end connecting with the waste pipe. Water now passing down the leader slowly accumulates in the receptacle, until the weight of the main pipe, the receptacle, and the water overbalances that of the balancing weight attached to the rope, and the main pipe and its attached receptacle descends, turning at right angles in its downward motion, so that the lowered end of the main pipe is disconnected from the waste pipe and connected with an opening leading to the cistern. When the rain stops, the water in the receptacle drains out slowly, and the main pipe again moves back to its former position.

AN IMPROVED FIRE ESCAPE.

A flexible fire escape, adapted to be attached to a window sill or other support and extended to the



BLOCK'S FIRE ESCAPE.

ground, is illustrated herewith, and has been patented by Mr. William Block, of St. Petersburg, Russia. The ropes are preferably of steel wire and the rounds of metal pipe, to secure strength with lightness, the wire ropes being passed through holes adjacent to the ends of the rounds, and held in place by a pin surrounded by solder. The upper ends of the ropes have an attaching device consisting of rods bent to form hooks of a convenient shape, with spurs, and a cross bar through which passes a clamping screw, whereby the device may be firmly attached to a window sill or other support on a building. The lower ends of the ropes are secured to rollers having disks which serve as flanges to hold the ropes on the rollers. When the fire escape is not in use, the whole is wound up to afford a light and compact package, as shown in one of the views.

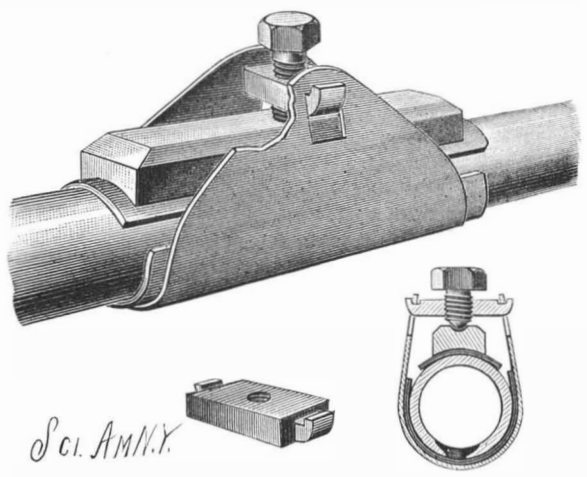
Further information with reference to this invention may be had of Messrs. H. Behr & Co., No. 75 Beekman Street, New York City.

Deer in New Zealand.

At a recent meeting of the Wellington Philosophical Society, Mr. J. W. Fortescue spoke of the rapid increase of deer that have been acclimated in the New Zealand mountains. Having had special facilities for observing these creatures, he proceeded to state some interesting facts as to their habits. At the close of his address Sir James Hector asked Mr. Fortescue, as an expert on the subject, whether the chief use of the antlers was not so much for fighting as for facilitating the progress of the stag through dense woods. He had considerable experience with the wapiti, in North America, and found that by throwing up the head, thereby placing the horns along the back, the animals were enabled to go forward with great rapidity and follow the hinds. He asked this, as it had been stated at a previous meeting of the society that the antlers tended to entangle the deer. Mr. Fortescue said that Sir James Hector was quite correct in stating that the antlers assisted the stags in penetrating dense forests. Mr. Higginson also bore out this statement from his experience in India.

AN IMPROVED LOCK-CLAMP FOR PIPES.

A device which may be readily attached to and detached from a pipe, to effectually seal and close a leak



PURDY'S LOCK-CLAMP FOR PIPES.

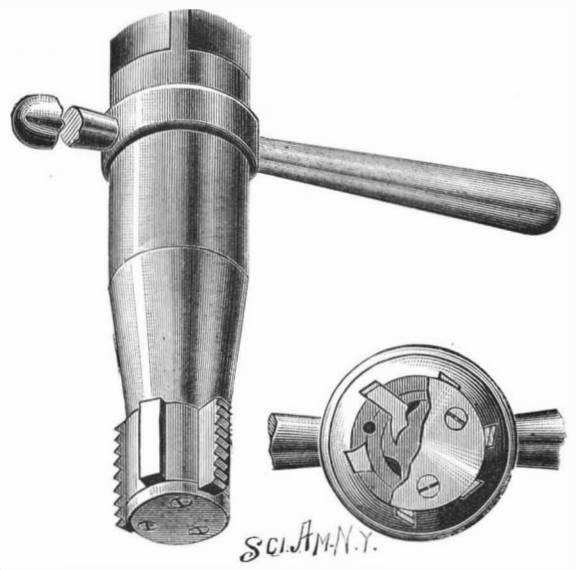
or split, or for other purposes, has been patented by Mr. William J. Purdy, of No. 357 Broadway, New York City, and is illustrated herewith, one figure showing a transverse section through the device applied to a pipe. The body of the clamp consists of a strip of spring metal bent in U-form, the upper end of each member having an aperture adapted to receive a yoke, shown in a small figure, and having a threaded aperture. Prior to placing the clamp upon the pipe, a strip of yielding or flexible material is placed on its inner surface, to abut against the pipe, and a bed block, likewise separated from the pipe by flexible material, is placed upon the upper surface, a bolt being then screwed into the threaded aperture of the yoke to bear upon the bed block and draw together the opposing members, holding them in rigid engagement with the lips of the yoke. The bed block may, if desired, be provided with a recess in its upper face, adapted to engage the reduced lower end of the bolt, whereby the bed block will be swiveled to the bolt.

IT is stated that Dr. Kauffmann, a Russian experimenter, has succeeded in solidifying petroleum, to be used as fuel, by heating it and mixing it with from 1 to 3 per cent of soap. The latter dissolves in the oil, and the liquid in cooling forms a compact mass having the appearance of cement and the consistence of tallow. The product is difficult to inflame, but when lighted burns slowly and without smoke, developing a high temperature, and leaving only 2 per cent of a hard black residuum.

THE Italian Admiralty have recently caused to be carried out a number of experiments with a view to testing the comparative merits of castor oil and of olive oil for lubricating purposes on board ship. From the results obtained they have given orders that henceforth all exposed parts of machinery are to be lubricated exclusively with castor oil, while mineral oils are to be used for cylinder and similar lubrication.

AN IMPROVED SCREW TAP.

An improvement in screw taps, providing means whereby the cutting dies may be projected outward or drawn inward, to enable the tap to be withdrawn after the thread has been cut, without the necessity of

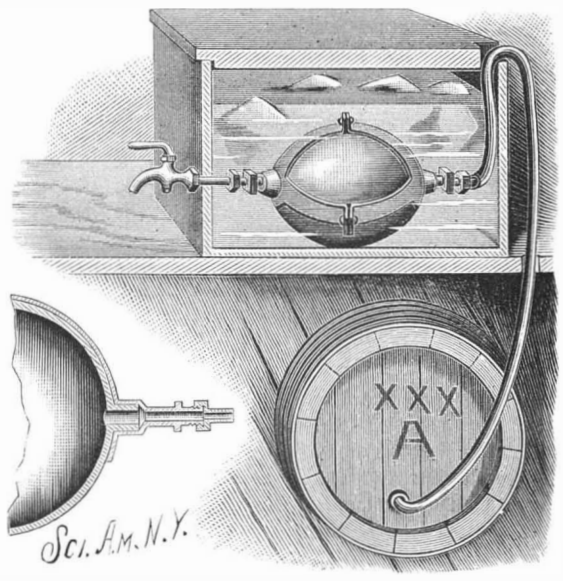


MATHER'S EXPANSIBLE AND COLLAPSIBLE SCREW TAP.

a reverse movement, is illustrated herewith, and has been patented by Mr. William Mather, of No. 245 West Tenth Street, New York City. The casing consists of a hollow mandrel provided at the cutting end with longitudinal slots or seats for the cutting dies. A spindle is adapted to turn in the hollow of the mandrel, having at the lower end a cam consisting of a reduced extremity and spaced longitudinal wings, as shown in the sectional view, there being a lip produced upon one inner side of the dies upon which the different faces of the cam acts, and by which the dies are respectively thrown outward and drawn inward. The spindle is reciprocated through the medium of a sectional handle, and in operation, to expand the dies, the handle sections are turned to the right, the dies being withdrawn by turning the handle in the opposite direction. Reaming dies are located in the forward or cutting end of the mandrel between the several cutting dies, and the dies when inserted in the longitudinal slots or seats of the mandrel, and into the under cuts of the cam, are retained in position by a cap plate apertured to receive the reduced end of the spindle.

AN IMPROVED RESERVOIR FOR COOLING ALES, ETC.

An improved apparatus whereby ales and similar liquids can easily be kept at a proper temperature, in a simple, inexpensive, and efficient manner, is shown in the accompanying illustration, and has been patented by Mr. William B. Hawkins, of No. 57 Christopher Street, New York City. The reservoir, which may be of any suitable material, as of stone, porcelain-lined metal, etc., is shaped more or less oval, with opposite inlet and outlet apertures, provided with nipples, and has a spider-like metal jacket made in two sections, each having an integral sleeve adapted to surround the nipples at the inlet and outlet. A length of pipe is attached to each sleeve, threaded at the ends to receive the coupling of the tubing leading respectively to the cask and to the draught faucet. The two sections of the jacket are united over the reservoir by screw bolts passing through their upturned contiguous edges. The



HAWKINS' COOLER FOR ALES ETC.

reservoir is submerged in a tank containing more or less ice, to cool the liquid to be drawn to the desired temperature, the reservoir to be made of a size adapted to cool as large a number of glasses as it may be called upon to supply at a time.

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A REMARKABLE RAFT.

(*Continued from first page.*)

idea of fastening with chains, and, indeed, induced James O'Leary, one of the largest importers of piles in New York, to advance money to carry out the experiment. The first raft was built in the summer of 1886, and the ways partially collapsed under the enormous weight.

Nothing daunted, Robertson, aided by O'Leary's money, pulled that raft to pieces, built a new cradle, and constructed another raft much larger than the first. The second one weighed some 8,000 tons. This was successfully built and launched, and would doubtless have reached New York in safety had it not been for unnecessary delay in towing, but it was lost at sea. The feasibility of the construction, launching, and towing of the monster rafts had been established, and Mr. Robertson immediately went to work to build another.

This one was successfully launched and brought to New York. Its appearance in the water is shown in our engraving. It is the shape of a cigar, and is of the following dimensions; length, 595 feet; width, 55 feet; girth, 150 feet; depth, 38 feet; weight, 10,000 to 15,000 tons.

The girth of 150 is for a length of nearly 400 feet. Within 100 feet of either end the raft tapers off to a girth of forty-eight feet. It is built on an enormous cradle resting on rows of pillars. The piles, which average forty feet in length, are fourteen to sixteen inches thick at the butts, and taper off to a few inches in thickness at the ends. They are laid in tiers, lapping over one another, to the depth of thirty-eight feet.

A massive chain runs through the center of the raft for its whole length. This chain is made of iron 1¾ inches thick. Its links are eleven inches long and seven inches wide.

At distances of ten feet are cross chains of one inch iron and links four inches long and three inches wide. These run in all directions, and are clamped on the outside tier of piles by cross arms of wood.

The raft was towed by the main chain, the cross chains being so arranged that the draught on the main chain binds the whole mass together in such a grip that it is next to impossible for it to go to pieces. The greater the strain on the main chain, the tighter will the raft be held together. But still further precautions were taken. Half way between the cross chains were attached three strands of steel wire, each one inch in diameter.

Thus the raft was bound together by iron chains and steel wire at distances only five feet apart. There were 22,000 sticks in the raft. When bound together as described, it was almost as compact and solid as though it was the trunk of a gigantic tree. The weight of the raft is estimated at 10,000 tons.

A ship is launched stern first, but this raft was launched bow first. At high tide 100 feet of the bow rested in the water. On either side of the cradle were heavy timbers, something like the bed of a tramway. When ready for launching, the cradle and raft were raised on ways laid along these timbers, and gracefully slid into the water.

The piles are worth five cents per foot in New York, or say $2 each. They cost sixty cents each at the point of shipment. An ordinary schooner will carry 500 or more in a cargo, at a freight of $1 each stick, or $1.60 laid down in New York. The 22,000 sticks in the raft would afford cargoes to forty-four vessels, and a freight of $21,000. The actual cost of the piles on the shore is $13,000. They will realize $44,000. That gives a profit of $9,000 if shipped by the vessels. Competent authorities say the whole cost of construction and towing will be inside $10,000, thus leaving a profit of at least $21,000.

Great opposition existed among the people along the shore to the experiment of rafting. They have urged the Canadian government to declare the piles so exported to be logs, and to enforce the export duty provided by statute at $2 a thousand. Estimating the quantity of lumber in the raft at 3,000,000 feet, this would mean a duty of $10,000, the payment of which to the Canadian government would place the cost of the rafting experiment on the same level as the export of piles in vessels, and, of course, would kill the rafting business.

The great raft was towed from Joggins across the ocean to and through Long Island Sound to Flushing, at the entrance of the East River, near New York, by two powerful tugs, the Ocean King and Underwriter. At the above point five additional tugs were attached to the raft, and the monster was then started down through the tortuous channel of the East River and Hell Gate, under the Brooklyn Bridge to the Erie Basin below Governor's Island.

Our engraving shows the appearance of the great raft during its progress down the East River. Our illustration was drawn from a photograph taken by Dr. J. J. Higgins, of this city, on the extra-sensitive Seed plate, No. 26, with a Gregg instantaneous lens shutter and rectilinear lens F—12 as the raft, having passed safely through Hell Gate, was now coming into the broad expanse of water at the southern end of Blackwell's Island. Time 12:30 P. M. Sun vertical.

The Beds of Rivers Arcs of Cycloids.

BY F. E. OPPIKOFER, CIVIL ENGINEER, PANAMA CANAL.

At the present time, when all over the world rivers are overflowing their banks, causing loss of life and property, and when millions every year are spent to prevent or alleviate the evil, we should like to call attention to a natural law of rivers, which has been suspected for twenty years by some, and which the writer of this has pursued further and has finally proved convincingly.

It has been found by leveling that the mean surface of the water of the Rhine from Lake Boden (Switzerland) up has a regular rise, notwithstanding some great turns, so that at the end of the first kilometer the fall is 0·04 per cent, at the end of the second 0·08 per cent, at the end of the third 0·12 per cent, at the fourth 0·16 per cent, and at the end of the thirtieth 30 times more than at the first—just 1·2 per cent. Such a line of descent is almost a perfect cycloid; that is, the line in which a body goes in the shortest time from a higher point to a lower and farther one, for instance, from a mountain to a valley or lake. It is a wonderful proof of how nature likes to take the simplest and shortest way, and exhibits the same accuracy as can be found in the most skillful work of man, for the Rhine profile is much more exact and regular than that of the railway near it.

An example still more surprising is found in the river Aare, where the engineers laid out a specific channel. After some years the river itself changed the artificially determined bed by raising it in places to the extent of a meter, and deepening it elsewhere to the extent of 1·7 meters, into a regular curve, a part of a cycloid.

It will be evident to any one that this remarkable and simple law will take a prominent place in river engineering, as soon as it will be thoroughly studied.

Grate Surface of Boilers.

One of the greatest mistakes that can be made in designing boilers, and the one that is most frequently made of any, consists in putting in a grate too large for the heating surface of the boiler, so that with a proper rate of combustion of the fuel an undue proportion of the heat developed passes off through the chimney, the heating surface of the boiler being insufficient to permit its transmission to the water. This mistake has been so long and so universally made, and boiler owners have so often had to run slow fires under their boilers to save themselves from bankruptcy, that it has given rise to the saying: "Slow combustion is necessary for economy." This saying is considered an axiom, and is regarded with great veneration by many, when the fact is, if the truth must be told, it has been brought about by the wastefulness entailed by boiler plants proportioned badly by ignorant boiler makers and ignorant engineers, who ought to know better, but do not.

Let us consider the matter briefly: Suppose we are running a boiler at a pressure of 80 pounds per square inch. The temperature of the steam and water inside will be about 325° F. The temperature of the fire in the furnace will, under ordinary conditions, be about 2,500° F. Now, it should be clear to the dullest comprehension that we can transmit to the water in the boiler only that heat due to the difference between the temperature in the furnace and that in the boiler. In the case of the above figures, about seven-eighths of the total heat of combustion is all that could by any possibility be utilized, and this would require that radiation of heat from every source should be absolutely prevented, and that the gases should leave the boiler at the exact temperature of the steam inside, or 325°.

To express the matter plainly, we may say that the utilization of the effect of a *fall* of temperature of 2,175° is all that is possible.

Now suppose, as one will actually find to be the case in many cases if he investigates carefully, that the gases leave the flues of another steam boiler at a temperature between 500 and 600 degrees. The latter temperature will be found quite common, as it is considered to give "good draught." This is quite true, especially as far as the "draught" on the owner's pocketbook is concerned, for he cannot possibly utilize under these conditions more than 2,500 − 500 = 2,000° of that inevitable difference of temperature to which he is confined, or four-fifths of the total, instead of the seven-eighths, as shown above, where the boiler was running just right, and any attempt to reduce the temperature of the escaping gases by means of slower "combustion," as he would probably be advised to do by nine out of ten men, would simply reduce the temperature of the fire in his furnace, and the economical result would be about the same. His grate is too large to burn coal to the best possible advantage, and his best remedy is to reduce its size and keep his fire as hot as he can.

This is not speculation, as some may be inclined to think. Direct experiments have been made to settle the question. The grate under a certain boiler was tried at different sizes, with the following result:

With grate six feet long ratio of grate to heating surface was 1 to 24·4.

With grate four feet long ratio of grate to heating surface was 36·6.

The use of the smaller grate gave, with different fuels and all the various methods of firing, an average economy nine per cent above the larger one, and when compared by burning the same amount of coal per hour on each, twelve per cent greater rapidity of evaporation and economy were obtained with the smaller grate. —*The Locomotive.*

The Siberian Railway.

According to *Engineering*, the Russian government would appear to have decided to push on the Siberian railway with energy; Mr. Balinsky, the engineer who constructed the bridge over the Oxus, having passed through there on his way to Siberia to construct by contract 1,000 versts or nearly 700 miles of permanent way, at a cost of 400*l.* a verst. This seems to indicate that the government will construct the railway itself, and in the cheap rapid manner that has proved so successful with the Transcaspian undertaking. The larger proportion of Siberia consists of flat country, resembling the prairie lands of America, and well adapted therefore for the construction of a cheap line. In connection with this a question of policy is involved of interest not only to Russia, but to England and her colonies also—that is, whether it is better to construct an expensive railway slowly across countries like Siberia or Central Asia, spreading the cost over a number of years, or build a rough line rapidly at a limited expense, improving it by degrees after the communications are complete. For the most part the railways of Russia were solidly built, their construction was slow, and the cost of most of them was heavy. Now that the confines have been reached, however, Russia seems inclined to adopt a totally different policy—running railways across large expanses rapidly, and thinking little of intermediate finish so long as important points are linked together, and better means of locomotion are provided than that of the *tarantass* or *telega*. In many parts of Siberia traveling in autumn and spring is absolutely impossible, owing to the absence of well-kept roads. It is obvious that in this case a railway on which, owing to rough workmanship, trains could only go at 10 or 15 miles an hour, would be deemed a godsend to the inhabitants, no matter how much the tourist from Europe might turn up his nose at the speed. The Transcaspian Railway, of which three miles a day were often laid, is roughly constructed, and the trains at present do not run at a greater speed than 15 or 20 miles an hour; but this continuous speed is rapid and luxurious traveling to the officials and troops previously compelled to ride on horseback the whole distance or perform it on the backs of camels. The object the Russian government aims at in connection with the Siberian railway is not so much to provide the country with a good solid line as to link the Pacific coast with Russia proper, as rapidly as possible, with anything better than the present means of communication. As Russian finances would not stand the former alternative just now, there would appear to be sound policy in adopting the latter. After the line is built throughout, it can be rapidly improved.

A New Spectro-Telegraph.

The spectro-telegraph is not a new invention, but a Danish physicist, Dr. Paul la Cour—surnamed "Denmark's Edison"—has constructed a new spectro-telegraphic apparatus on a principle of his own, which promises to become important, and which he now exhibits at the Copenhagen exhibition. On the high roof of the establishment National, some distance from the exhibition, he has placed an apparatus which, when seen from the exhibition grounds, shows a vertical steady spectrum. On being examined by a specially constructed telescope, a number of red and blue dots and lines are seen to appear and disappear exactly in the same manner as the dots and lines on the tape of a Morse telegraphic apparatus. This is spectro-telegraphy, and, by the aid of this apparatus and a telescope, messages may be transmitted at night with the same exactitude as by the electric wire. The invention will be particularly valuable in navigation, as, for instance, two ships may signal to each other without any fear of being misunderstood, while the beam from a lighthouse or harbor light may be made to flash any message to a passing vessel. The details of Dr. La Cour's apparatus are kept a secret, but it is known that the effect is obtained by the breaking of the spectrum by means of little slits opening and shutting, displaying the colored dots and lines. This is again effected by an electrical apparatus, fitted with keys lettered and numbered.—*Iron.*

ACCORDING to *La Nature*, an immense terrestrial globe, constructed on the scale of one millionth, will be shown at the Paris exhibition of 1889. The globe will measure nearly 13 meters in diameter, and a town the size of Paris will barely occupy a square centimeter of its surface. The globe will rotate on its axis, and thus represent the movement of rotation of the earth.

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Peculiar Electrical Phenomena.

Some very singular electrical phenomena, says the *English Mechanic*, were observed on two very dry days at a printing office in Mayence, when the establishment seemed to be converted into a huge electrical battery. Electric sparks several centimeters long could be drawn with the fingers from all parts of the printing machinery, just as may be done from a charged electric machine. The action of the sparks became so pronounced that the layers-on and takers-off (who, it should be remarked, in German printing offices are mostly young women) refused to work, as burning sparks were emitted every time the machines were touched with the hands. The electrical phenomena were most striking in the machines used for lithographic printing. A strong paper made of cellulose was being printed at the time, and the takers-off observed a slight crackling as the sheets, which adhered pretty closely to the oil cloth covering of the cylinder, were being withdrawn. This crackling was finally developed into a loud explosion, accompanied by beautiful flashes from ten to twelve centimeters (from four inches to five inches) in length. The discharges are stated to have been more effective the more quickly the sheets loaded with electricity were withdrawn. A small circular saw mounted about four inches from an iron column discharged at intervals of from 20 to 30 seconds, when driven, powerful electric sparks, accompanied by loud explosions, upon the column. These phenomena were observed for hours, and continued for two days, when the printing office became free from electricity, and has remained so since.

The following explanation is given of the occurrence: The outer walls of the building in which the printing machinery is placed are separated from the surrounding soil by a thick layer of asphalt, serving to keep the moisture arising from the soil from penetrating the walls. In the present case the asphalt at the same time served to isolate the electricity generated within. The floors of the several machine rooms are also laid thick in asphalt, and the machinery is fixed direct to this flooring, so that it is likewise perfectly isolated. There are only a few iron columns having direct connection with the earth. On the morning of the day on which the startling phenomenon described was first observed, all the machine belts had been greased with a mixture consisting of resin and linseed oil, serving to increase the friction between the belts and the pulleys. As soon as the machinery was set in motion, each individual pulley was converted into an electric machine on a large scale, negative electricity being formed on the belt covered with resin, and positive electricity on the iron pulley. The stored electricity, of course, was immediately given off whenever one of the machines, which for the time being were changed into accumulators or secondary batteries, was "tapped."

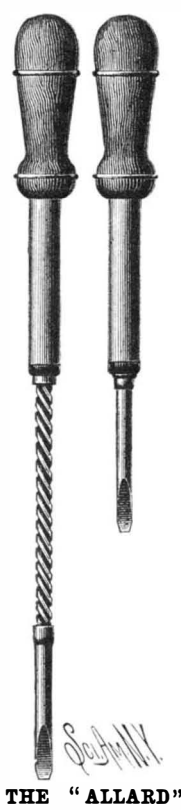
Worsted Yarn Scouring and Bleaching.

In scouring wool nearly all the natural grease is removed from it. This renders the wool so harsh and dry that it cannot be combed and spun. So it is found necessary to return to it a certain amount of grease or oil. For this purpose olive oil is the most suitable and the most easily removed, but, in many cases, at the present time a mixture of paraffine oil and an animal oil, called a wool oil, is employed. During the spinning the yarn gathers dust and bits of solids, and when the yarn is to be scoured these must be removed as well as the grease. A simple alkaline bath would be sufficient to remove the oil, but the action of a fixed alkali upon wool is considered disadvantageous before bleaching, and even a small quantity should be avoided. Ammonia should be used if any alkali must be employed. The common treatment consists in hot soapings with a neutral olive soap. The ordinary rectangular wooden box should be used, and the yarn manipulated in the usual way upon sticks. The hanks are turned in the usual way during the soaping. Fifty pounds is a convenient quantity to wash in one box. Run into the box 200 to 250 gallons of water, add four to five pounds of soap, dissolve and raise to 120° Fah., and enter the wool, work for fifteen minutes, allowing the temperature to rise, but not to exceed 190° Fah., under any circumstances. Wring, and repeat the treatment, but use three pounds of soap. If any difficulty is found in removing the oil, add a few ounces of ammonia water to each bath. The olive oil is easily removed, the wool oil with more difficulty, but usually perfectly if it contains a sufficient per cent of animal oil. Now wash over with cold water, wring, shake out, and introduce at once into the bleaching chamber.

The bleaching chamber should be built of brick, and the hanks can be hung upon poles. The sulphur should be burned at the bottom, and the fumes circulated up through the chamber. The yarn should be kept in the sulphurous acid for 24 hours. It must then be withdrawn and washed with warm dilute soap (1 pound for 50) containing a little soda. If a treatment for 24 hours does not give sufficient whiteness, then the yarn is wrung and returned to the chamber. After the final wash the yarn can be tinted by passing it through a bath containing a very small quantity of indigo extract if a blue white is desired.—*Textile Record.*

THE SPIRAL SCREW DRIVER.

Since the introduction, by Mr. F. A. Howard, of Belfast, Me., of the original Allard patent spiral screw driver, which on account of its great merit as a labor saving tool has found many imitators, various parties have used different devices to avoid the original patent. The accompanying illustration represents the screw driver with the bit extended and with the bit closed. To drive a screw, as is well understood, the point of the screw driver is placed in the nick of the screw, and held there by the thumb and finger while the handle is gently withdrawn, thus extending the bit, after which it is only necessary to press on the handle in a straight line with the axis of the screw, the spirals on the upper part of the bit causing it to rapidly revolve. The screw is withdrawn as with a common screw driver. This tool is especially designed for light and rapid work, for the use of mechanics, such as machinists, gun and locksmiths, cabinet makers, coffin makers, carriage makers and all who have large quantities of small screws to drive, thereby avoiding the tiresome turning of the hand and twisting of the wrist. The best quality of material is used and superior workmanship employed in the production of the "Allard," which retains its hold on popular favor, and the sales of which are said to exceed those of all its competitors. The New York agents are the Alford & Berkele Co., of No. 77 Chambers Street.



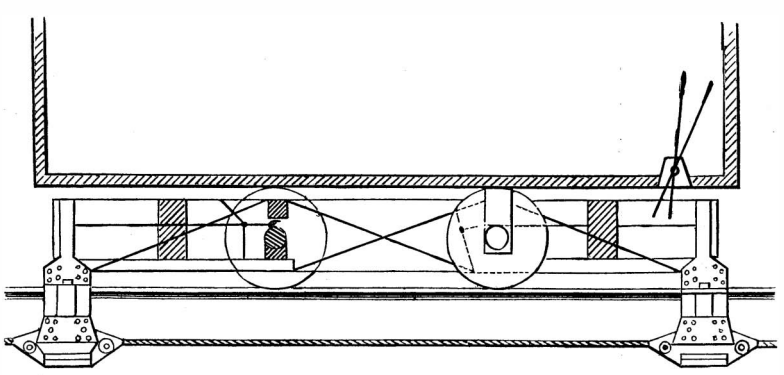
THE "ALLARD" SCREW DRIVER.

Plane Tree Pollen Causing Influenza.

A German resident of Barcelona recently published the fact that severe attacks of influenza—exactly like those which we call in this country "rose" or "hay colds"—have afflicted the members of his family year by year in spring, and that he has at last traced them with certainty to pollen dust from the plane trees which surround his home. A German scientific journal thereupon declares that the evil influence of plane tree pollen upon the stomach, throat, eyes, and ears was a well known fact in antiquity, both Dioscorides and Galen having called attention to it. That German scientific men will acknowledge that an influenza may be produced by pollen dust of any kind will surprise many American travelers; for many must remember their experience with German physicians, who have laughed the idea to scorn, refusing to believe in the periodicity of the attacks from which their foreign patients suffer, or in the potency of the cause to which those patients attribute them.—*Garden and Forest.*

AN IMPROVED CABLE CAR CLUTCH.

An improved system of cable car clutches and switches, designed to enable the cars to turn a corner and exchange lines of cable, has been invented by Messrs. Henry and George Davenport, of Somerville, Philadelphia, Pa., the illustration herewith showing a longitudinal section of the improved car. To the framework of the car are pivoted frames in the outer ends of which are journaled the shanks of the grips, each frame carrying a roller which rides upon a curved track, and the devices at the front and rear of the car being alike. The grip has a sliding bar carrying a lower jaw adapted to move upward, and clamp the cable, the frame having a guide beveled at its ends and carrying guide rollers for holding the cable while the jaws are being brought into engagement therewith. Upon one end of the car are arranged two levers, each connected by a rod with an arm on a shaft adjacent to each of the axles of the car, and to each clutch-supporting frame is attached one end of a spiral spring, the opposite end being connected with the body of the car, the spring acting to draw the frame over to cause the clutch to enter the switch and follow the curve leading from one track to another. To transfer a car from one track to another, the front grip is detached and allowed to follow the curved slot, while the car is pushed forward by the rear grip until the front grip enters the conduit of the second cable and is engaged therewith, when the rear grip is released, and the car moves forward on the second track as before.



DAVENPORT'S IMPROVED CABLE CAR CLUTCH.

Reduction of Low Grade Ores by Electricity.

The Utah Mining and Reduction Company, whose works are located at Bingham, ten miles south of Salt Lake City, are using the new "Meech process" in the reduction of their low grade and rebellious ores with success.

The ore is passed through a crusher and rolls, crushed to 40 mesh fine, thence into a disintegrating machine, four tons at a time, through a valve, with sufficient water and chemicals to treat the sulphur and refractory elements. Steam is then admitted to a pressure of 100 pounds per square inch, and, at the same time, the mullers are revolved at about 30 revolutions per minute, generating electricity in such volume as to greatly assist in the decomposition of the ore.

This is continued for three hours. The ore is reduced to an impalpable powder, many times finer than is possible by other methods, and is thoroughly decomposed and desulphurized.

The water absorbs the chemicals, every atom of gold is made bright, and in condition for amalgamation. The pulp is now discharged into the amalgamator below, a revolving machine seven feet long and five feet in diameter, in which are copper plates placed lengthwise, and, by hydrostatic pressure, quicksilver is thoroughly pressed through the ore, by a "settler" of peculiar shape, having an electric copper wire broom to assist in gathering the fine amalgam before the tailings are discharged.

The cost of the treatment is from two to three dollars per ton, and as the gold ores treated run from $12 to $20 per ton, it leaves a handsome margin for the owners.

The ore veins are large, and thousands of tons, or enough to supply the mill for the next 100 years, are already in sight.

By this process about 90 per cent of the gold is saved.

The works occupy about nine acres of land on the banks of the Jordan River, and consist of two main buildings, 32×64 and 24×34, one two-story boarding house, one blacksmith shop, two 35 horse power engines, one crusher, one roll, and other necessary appurtenances, are connected with the mines by the Denver and Rio Grande and Western Railway, and demonstrate in a practical manner the immense sums that can be realized from the treatment of low grade and refractory ore dumps, that have heretofore been considered absolutely worthless.

What the Cow Gives Annually to the United States.

Under the title of "What the Cow Gives Us," originally from the *American Breeder*, a statistical article is going the rounds of the dairy and trade press showing the extent, value, and importance of the dairy industry. What the cow gives us is declared to be $500,000,000 worth of dairy products, good, bad, vile, poisonous or otherwise, as estimated for last year in milk, butter, cheese, water, acids, chemicals, color, oils, etc. The proportion of milk, butter or cheese produced does not, of course, appear, but taken as a whole the article is intended to show the great money value in cows and cow products, and the importance, commercially and politically, of the 4,000,000 farmers who own them. Whether the figures are correct or not, there is no doubt that the dairy industry is very large, and susceptible of still larger expansion. One thing, however, is very certain, that out of 1,350,000,000 pounds of butter said to be made last year, at least one-third of it ought never to have been permitted to have been sold for food. The same may be said of cheese, a big part of the annual product being skim or filled cheese, and about as nutritious and digestible as sawdust. Competent observers are of the opinion that a large part of the increase, both in production and value of dairy products, represents merely the increased adulteration and dishonesty on the part of the dairymen and farmers. Take from the estimates of "What the Cow Gives Us" the beef and hog fats and vegetable oils, not to speak of the more pernicious adulterants, such as chemicals and acids, salt, water, coloring matter, and other things which are taken from various sources and finally credited to the cow, and the real showing would be much less.—*Produce Exchange Bulletin.*

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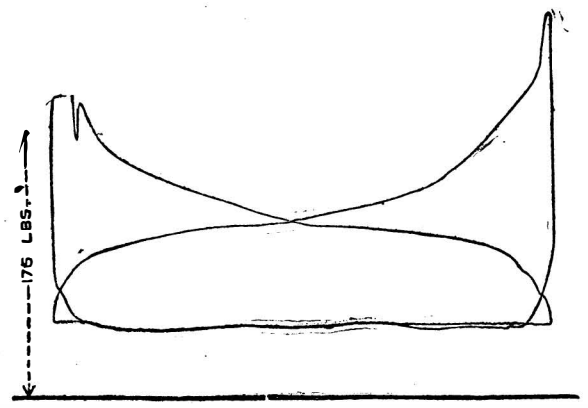
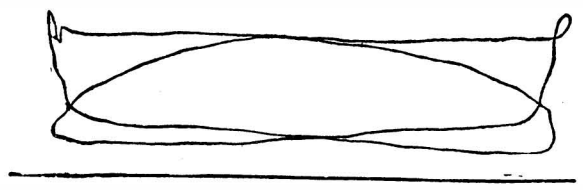
ECONOMICAL TRIPLE COMPOUND SEMI-PORTABLE ENGINE.

At the Nottingham show, Marshall & Co., of Keighley, exhibited a triple expansion semi-portable engine, we believe the first of the type made, and as it is non-condensing, its performance from an economical point of view is not without interest. The accompanying illustration is from *The Engineer*. The tabular statement gives particulars of the engine.

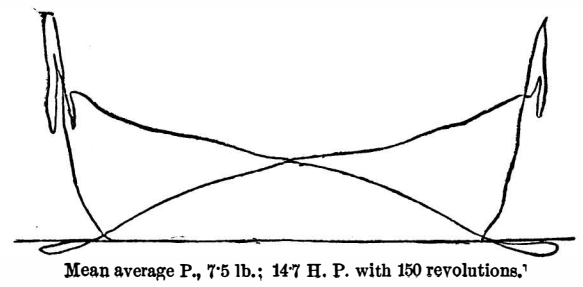
Boiler	I. H. P. 36·5	I. H. P. 40
Length of barrel	6 ft. 2 in.	—
Diameter of barrel, ext	2 ft. 6¾ in.	—
Width of fire box, out	2 ft. 7½ in.	—
Length of fire box	3 ft. 6 in.	—
Height of fire box from grate	2 ft. 10 in.	—
Area of grate before trial	6·3 sq. ft.	—
Area of grate at trial	5·7 sq. ft.	—
Tubes, number	38	—
" diameter outside	2 in.	—
" length	6 ft. 3 in.	—
" steel	—	—
Heating surface, fire box	34 sq. ft.	—
" " smoke box	4·1 sq. ft.	—
" " tubes	120·0 sq. ft.	—
Total	158·1 sq. ft.	158·1 sq. ft.
Per square foot of grate	27·72	Trial 27·72
Area through tubes	1·252 sq. ft.	—
Ratio of area through tubes to grate	0·19	—
Pressure lb. per square inch	150	175
Engine :		
Diameter of cylinders	5½, 9, 15½	5½, 9, 15⅛
Length of stroke	14 in	14 in.
Revolutions per minute	145	150
Time of running	4 hours.	2 hours.
Water :		
Total quantity used	2,080 lb.	1,140 lb.
Evaporated per lb. of coal	9·4	9·8
Amount drawn from jacket	157 lb.	84 lb.
Per I. H. P. per hour	14·12	14·25
Temperature of feed from 55° through coil of pipes into S. B.		
Coal :		
Total quantity used	220 lb.	116 lb.
Per I. H. P. per hour	1·506	1·45
Per square foot of grate	9·64	10·1



Boiler pressure, 175; initial P. in cylinder, 173·5; mean average pressure, 54; 13·3 H. P. with 150 revolutions.



Mean average pressure, 18 lb.; 12 H. P. with 150 revolutions.



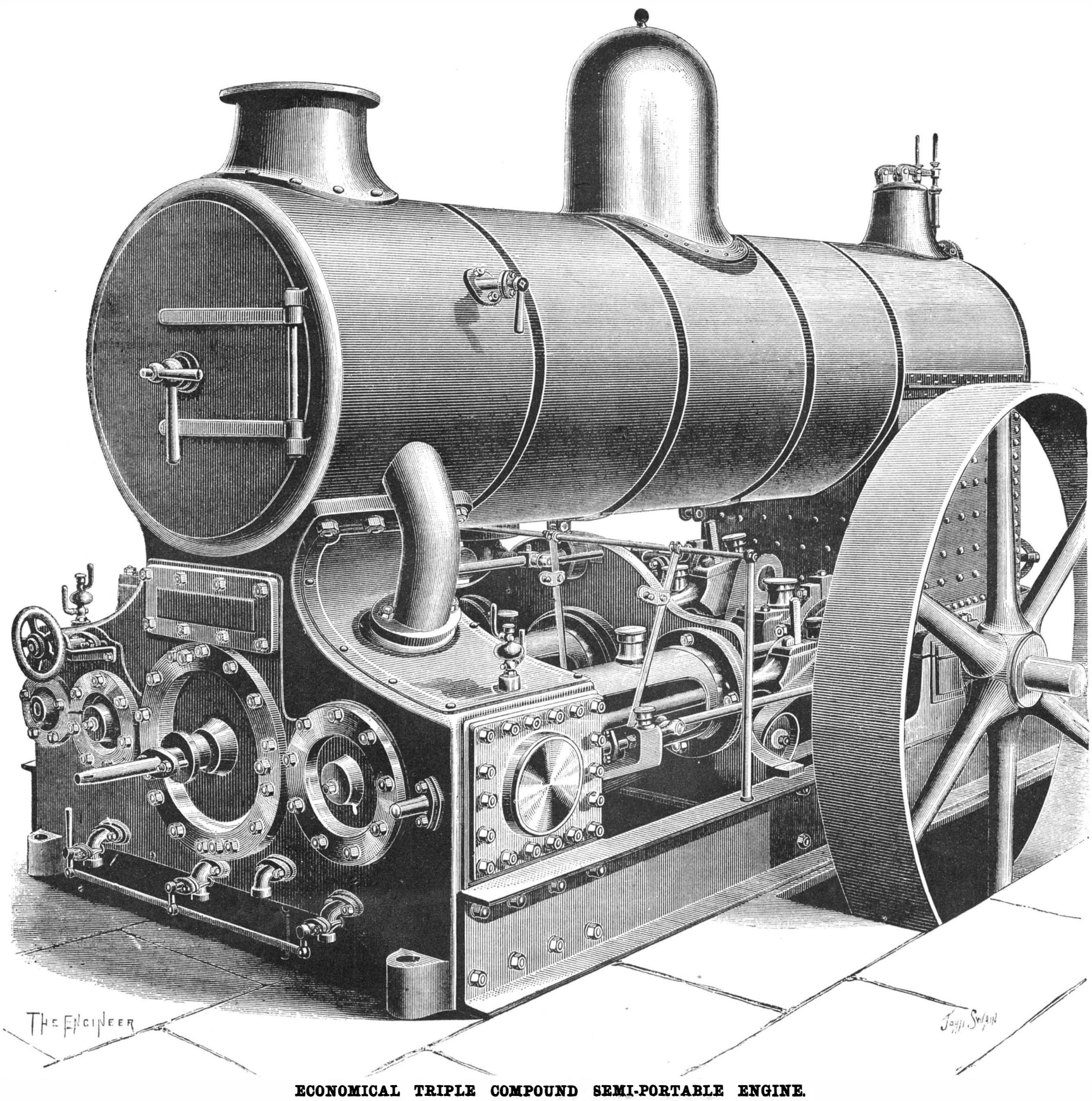
Mean average P., 7·5 lb.; 14·7 H. P. with 150 revolutions.

We also give three sets of diagrams. The curious looping at the beginning of the stroke in the low pressure cylinder is, perhaps, partly due to a bad connection between the crosshead and the indicator drum. The looping at the toe is due to the steam having been expanded below the atmospheric line.

Vegetable Wax.

Japan wax is obtained from a tree, *Rhus succedanea*, which is found in Japan, China, and throughout the East Indies generally. In the Japanese language it is called *haje* or *haze*. The tree commences to bear fruit when five or six years old, and increases its product every year, till at fifty years a single tree will produce 350 pounds of berries, from which 70 pounds of wax can be obtained. The wax is formed in the middle of the berry, between the seed and the skin, like the pulp of a grape. It is extracted by boiling the berries in water, and allowing it to cool, when the wax separates out in a solid cake. The specific gravity of this wax is 0·970, and its melting point 131° Fah. It is largely used, either alone or mixed with tallow, by the Chinese in the manufacture of candles. The principal port of export is the city of Osaka, whence, in 1876, nearly 2,000,000 pounds of the wax were shipped to London.

THE new 6 inch gun, throwing a 100 pound projectile, and penetrating 13 inches of plating at 1,000 yards, is a gun of sufficient power to deal with almost anything built or building. It may fail to penetrate the strong patch, but it may knock any other part of the ship, and most of the men, to pieces. Mounted on the broadside, under armor, in a small port pierced in a turret which the gun itself rotates, training 120 degrees, and firing eight rounds a minute, with a crew of three or four men only, and weighing but five or six tons, announce in their faces the death of the turret and the barbette.—*Broad Arrow.*



ECONOMICAL TRIPLE COMPOUND SEMI-PORTABLE ENGINE.

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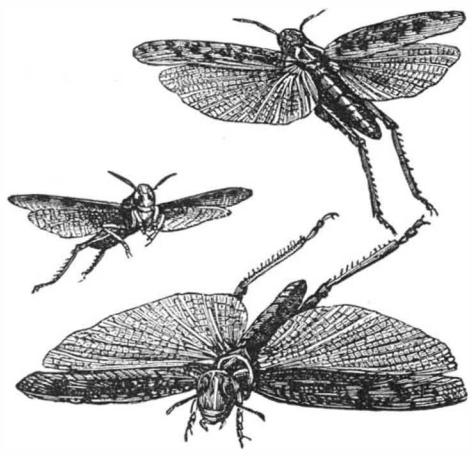
THE PLAGUE OF CRICKETS IN ALGERIA.

The lamentable visitation of destructive insects by which the whole province of Constantine, in the French dominion of Algeria, has this year suffered enormous damage to its crops of every kind of grain, was at first attributed to locusts, supposed to resemble those of ill fame, ancient and modern, in the countries of Western Asia and the Levant. It has since been ascertained that the present enemy is neither the locust nor the migratory grasshopper, but a native species of cricket, known to scientific entomologists as the *Stauronotus Maroccanus*, which is bred on the dry and bare highlands above the Tell of Algeria, and elsewhere on the



ADULT WINGED CRICKET (STAURONOTUS MAROCCANUS), MALE AND FEMALE.

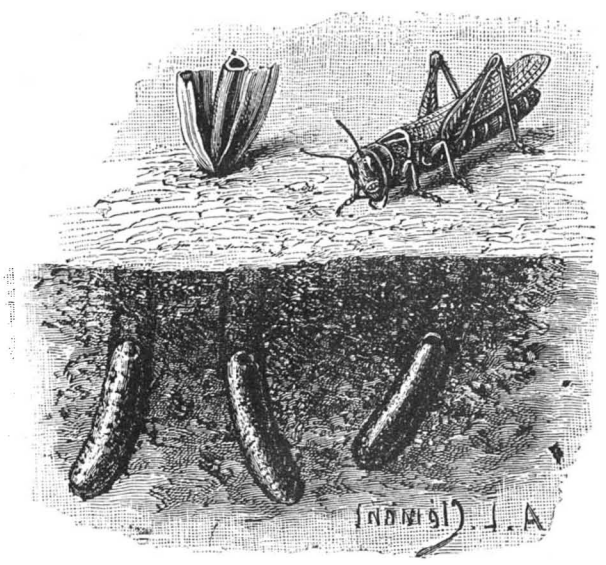
slopes of the Atlas mountain range, and which has been observed during the past three years, descending into the cultivated region of Algeria, toward the shores of the Mediterranean. Its ravages have been experienced in Morocco, it is said, on several former occasions.

The locust, the cricket, and the grasshopper belong to different families of the Saltatoria, or leapers, a section of the order of orthopterous insects.

The famous or infamous migratory locust of Asia and Africa is a big insect, two inches or two inches and a half long, with strong hind legs of nearly the same length, making prodigious jumps, and is therefore a rapid traveler. Wo to the country over which it travels! "They consume as a fire, and the land is utterly burned up." The prophet Joel gives a terrible, but exact, description of the locusts in Judea. When in the wingless condition in May and June, their arrival is more to be dreaded than after they begin to fly, because in the latter state vast clouds of them may be driven aside by the wind. Through such a cloud in the sky overhead, the sunlight is yellow, as through a smoky fog. Where they have descended, every blade of grass, every leaf of a tree—the very bark, if tender, of many trees—with all fruit and grain, will presently disappear. They are not stopped by the water of a shallow pool or stream, for the bodies of those who first enter it soon form a bridge, over which the mighty host can pass. Cold, rainy weather may kill them, but human efforts do comparatively little, though in Cyprus, seven years ago, by order of the British government, and by the digging of ditches, with the sides lined so that they could not climb out, 250 tons of dead locusts were obtained, and their weight is above ninety million insects to the ton. Where huge heaps and banks of their rotting bodies have remained on the ground, the pestilential stench has been smelled a hundred miles away. They supply, however an inexhaustible store of food to many kinds of birds, to some beasts, and to all sorts of worms and reptiles.

The *Stauronotus Maroccanus* is a very noxious creature. The female, which is the larger, measures three-quarters of an inch to an inch and a quarter in length, and the male commonly about three-quarters of an inch. Its color is russet or reddish brown; the corselet on the back is marked with an oblique cross, and there are vertical bands of alternate light and dark hues along the lower part of the body. The pair of adult insects, male and female, furnished with powerful wings, of which we give an illustration, are parents of this pernicious race. The female seeks to lay her eggs about the end of June or at the beginning of July. She chooses dry and sterile ground, in a situation not likely to be disturbed; and uses a natural apparatus, a valvular sucking tube, at the extremity of her abdomen, to lift and remove the grains of sand, boring a hole in the earth, about an inch deep. In this hole she deposits the ovary, a cylindrical case or shell of hardened mucilage, three-quarters of an inch long, containing all her eggs, some forty in number, very neatly packed together; then she covers them by filling up the hole. They are slowly hatched by the heat of the sun in the earth, where they remain nine months, until the newborn insect emerges, in the spring of the next year, a little white caterpillar, which speedily becomes a cricket, and is then quite ready to attack and devour the graminaceous plants for which it has a predilection. They swarm in millions all over the land, and by a mysterious instinct are guided to distant corn fields, advancing in vast and dense columns with a wide front, keeping the closest possible array, to conquer and despoil the agricultural industry of mankind. While on the road through the wilderness, or in a pastoral region, they will eat grass or any green herb; but as soon as they enter a field of wheat or barley, it is a wonderful sight to observe their passionate alacrity. They rush at every corn stalk, five or six of them climbing up it at once, and presently gain the top, which bends under their weight. Then, with the sharp-edged shears of their upper jaw mandibles, two strong horny hooks moving horizontally, crossing each other like the blades of a pair of scissors, they quickly cut the ear of grain to pieces, feeding on its farinaceous part, while they disdain the husks and the stalk. In attacking an ear of barley, they of course begin operations by stripping off the spikelets of its beard, which they do not eat; the husk of every grain is also torn off and thrown away. The business-like precision and skill with which these insects go to work, in their foraging among the corn, may be appreciated by the aid of our illustrations, showing the different stages in their treatment of the unfortunate plant. Any crumbs of farina that the busy plunderers aloft may let fall to the ground will be eagerly seized by the vast multitude below, which cannot find an unoccupied stalk to ascend; but, unless they happen to be famished by a very long march over bare ground, they despise the husks and straw. The insect army, gorged with a plenteous repast, and perhaps exulting in its victorious prosperity, marches on to fresh fields and pastures new. The agriculturists of the neighboring village are ruined. It is all over in a few hours. The *Stauronotus Maroccanus*—a tremendous name for a terrible, tiny foe—has conquered and devastated the country in a very brief campaign more effectually than would have been done by a barbarous human invader.

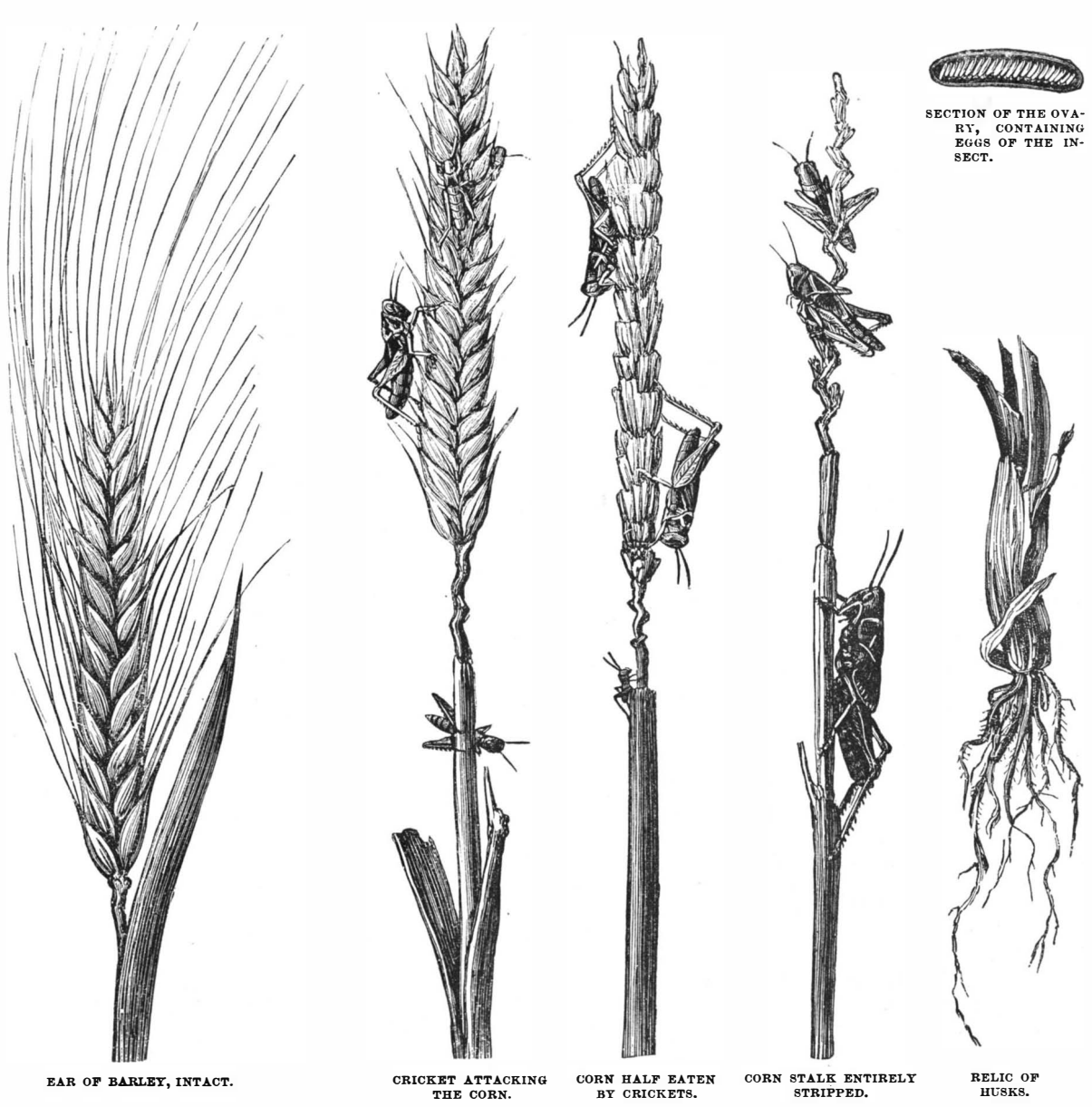
These ravages, in the part of Algeria where they have most prevailed, already extend over a territory three or four hundred miles in length, and the estimate of



CRICKET WITH ITS OVARIES BURIED IN THE EARTH.

the damage at six or seven million francs, which was made some weeks ago, has probably been much exceeded. The aspect of the country this summer is dismal and distressing, the cultivators are in despair, and the attempts to kill or drive away the insects have been quite unsuccessful. It seems impossible to stop them on the march, or to do anything with them afterward, when they have taken wings to themselves. The only plan to be recommended is that of searching, in the autumn and winter, for the places where they have laid their eggs, and either destroying the vitality of these by some chemical application, or watching for the appearance of the caterpillars, in March or April, and killing them before they can do any mischief.

Locusts, in most parts of the north of Africa, have always been dreaded as the most formidable natural enemy. The Arabs, however, eat locusts, as John the Baptist did; and one would not object to them boiled, with wild honey, or stewed in butter. Among the numerous accounts of them, in different countries, is that of Mr. Barrow, who visited a territory where, he says, they covered an area of 2,000 square miles. They had reached a broad river, and, in endeavoring to get at the reeds growing along its banks, such enormous quantities of the insects had been drowned that the whole river was filled with their dead, so that its water remained scarcely visible when he was there. On the seashore, when the winged insects came there, a strong wind drove them into the sea, which afterward cast their bodies up on the beach, forming a bank three feet or four feet high, for a length of fifty miles along the coast. It is a mercy to southern Europe that they cannot travel across the Mediterranean. —*Illus. London News.*



SECTION OF THE OVARY, CONTAINING EGGS OF THE INSECT.

EAR OF BARLEY, INTACT.

CRICKET ATTACKING THE CORN.

CORN HALF EATEN BY CRICKETS.

CORN STALK ENTIRELY STRIPPED.

RELIC OF HUSKS.

First Voyage of the Steamer City of New York.

This new Inman line steamer took 8 d. 11 h. and 29 m. corrected time in making her first passage this way across the Atlantic, arriving at New York in the early morning of August 10. The vessel was actually steaming only 6 d. 21 h., the circulating pumps getting out of order. Those who have expected she would be a very fast vessel, and perhaps beat all previous records, are, however, as confident as ever that she will quite equal their anticipations after her machinery has had a little wear. An illustrated description of the vessel appeared in our issue of April 14.

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British Naval Maneuvers.

Some of the principal vessels of the British navy have been lately engaged in active maneuvers for the purpose of practice and instruction. Milford Haven was the locality chosen. Two fleets, A and B, were assembled, one for offense, the other for defense. We make the following abstracts from the *Broad Arrow:*

The vessels were collected together very expeditiously, and arrived at the starting point of their operations in a state of preparedness for service which reflects the highest credit upon the Admiralty and dockyard officials.

There never before existed anywhere a naval squadron possessing such powers of offense and defense as are to be found in these two fleets, simply because ships, guns, torpedoes, and all the other paraphernalia of naval warfare were never before so destructive, and never before were such elaborate measures taken to secure safety against the weapons of the enemy. In comparison with the duties to be performed, and with the naval forces of other powers at the time, the British navy of eighty years ago was undoubtedly much stronger than we can show to-day, but absolutely the British experimental squadrons of 1888 are by far the most formidable ever mustered.

"A" fleet consists of thirteen armored vessels, eleven cruisers, two torpedo gunboats, and twelve first class torpedo boats, while "B" fleet consists of nine armored vessels, eight cruisers, two torpedo gunboats, and twelve first class torpedo boats. Hence the British fleet "A" and the supposed hostile fleet "B" together contain no less than twenty-two armorclad vessels, nineteen cruisers, four torpedo gunboats, and twenty-four first class torpedo boats.

The greatest difficulty in handling this large collection of vessels is found to be that of keeping them supplied with coal. The commanders of the two fleets have speedily discovered this to be the case, and if such a difficulty arises so soon after commencing operations on our own shores, what would be the position of a fleet blockading an enemy's ports or attacking his commerce for any length of time? The delays in coaling the fleet at Milford have been put down to the credit of the colliers and the coal merchants, and perhaps with some justice, but in the event of the war operations being real, is it to be supposed that these blunders would be less likely to happen than when the ships are merely playing at war?

Not only was there delay through a misappropriation of the coals carried by the several collier steamers, but in addition both delay and disaster resulted from the attempt to coal heavy armorclads in an open roadstead. The damage suffered in this way by the Benbow seems to have delayed the whole fleet for nearly twenty-four hours. Now, if there was a difficulty in avoiding damage to booms and gun sponsons when receiving coals from a merchant steamer in the comparatively land-locked waters of Milford Haven, how much less likely is it that damage would be avoided when coaling at sea, outside a harbor, or on an ocean commercial track?

These considerations are deserving of notice, more especially from the fact that they appear to a large extent to be inevitable conditions of modern naval warfare, and are such as would tell as much at least in our favor as in that of our possible enemies. A great naval war between two maritime powers has not been fought since steam power entirely supplanted the use of sails in the largest war ships, and consequently we have little or no experience as yet of the true part which will be played by the coaling question in future naval operations on a large scale. These experiments seem to afford us some small idea of what would happen in the event of a war, say between Great Britain and France.

It is not only in the expense of chartering steamers to carry coal to our ships engaged in operations off the enemy's ports that the penalty of wholly abandoning sail power would be paid, but also in getting the colliers to their destinations in safety, and then in transferring the coals from the colliers to the fighting ships. A shrewd enemy would lie in wait for the defenseless colliers, and by sinking or capture prevent them from taking the essential supplies of coal to the fleet. Without that coal, an attacking or blockading fleet would be helpless and useless.

Almost all the torpedo boats have come to grief in one way or another. Of the six belonging to the Lough Swilly squadron, only one arrived intact. All the others developed some weakness or other, either in the form of leaky steam pipes, burnt boiler tubes, or some other defect in the machinery department.

War having, according to the Admiralty instructions, been duly declared at noon on the 24th of July, the same afternoon the Amphion cruiser, one of Sir George Tryon's blockaded squadron, came sufficiently near the blockading ships to be chased by the Inflexible, which opened fire, but was soon left behind out of range, closing Lough Swilly, and getting within the circle supposed to be swept by powerful forts mounting ordnance of 100 tons weight, with numerous smaller 22 ton guns of 9·2 inch bore. Admiral Rowley continued to advance with his battle ships and cruisers, returning the fire of the Rodney until within the prescribed range of the fortresses, when, according to the rules of the mimic war, she and her consorts returned to their blookading stations. At Berehaven, the Rupert being left with her mines and cables guarding the entrance, the Hercules leading, the blockading squadron was sighted soon after noon on the 25th, composed of the Benbow, Conquerer, Collingwood, Northumberland, Northampton, Hotspur, and Mersey. The blockaded force, which had sallied out, consisted of the Hercules, Warspite, Ajax, Hero, Iris, Cossack, and Volage. The Mersey seemed intent upon cutting off the latter vessel, and therefore the Iris and the Severn, twin sister to the Mersey, were dispatched, and, coming within range, fire was opened, and then the Mersey, at once putting on all steam power, ran out of range of their guns and within the protected fort circle. The blockading squadron keeping at a distance, and not coming near the fire of the forts, Admiral Tryon exercised his vessels in steam tactics, of which they appear to have had little or no experience. The event of the greatest importance is the reported escape of the Iris, which will now be free to prey upon commerce in accordance with the rules issued by the Admiralty.

The escape of the Iris was observed by the Active and the Rover, but as the Iris steamed 17 knots and her pursuers scarcely 14 and 12 knots respectively, she was soon out of sight, nor does it appear that the Arethusa, sent to Milford and coaled, to be ready for any such eventuality as the escape of a blockaded cruiser, is likely to catch her, for she rolls and jumps about in a very uneasy manner, scooping up the sea at her gun sponsons, and sending a deluge of water over her deck, whereas the Iris seems both drier and steadier as well as faster. The maneuvers have already shown that the Sandfly and vessels of her class are unsuitable for war purposes, and the engines of some of the other classes seem to shake them far too severely. In the heavy breechloaders there has been an accident with one of the Rodney's guns, temporarily disabling it, and we are now finding out several weak points. The Northampton's steam steering gear broke down, and occasioned considerable loss of time in its repair, and several of the torpedo boats were troubled with leaky joints in their steam pipes or boiler tubes. The Calyso's boiler tubes also proved leaky on her being driven at a high speed, and there have been several minor accidents, partly occasioned by a want of familiarity with the work. On the whole, so far as the handling of our war ships and practicing them in useful maneuvers goes, there is every reason to be well satisfied that the mobilization of the fleet was urgently required, and will, we believe, hereafter lead to very great improvement, by instructing the officers far more thoroughly than is the case at present in steam tactics.

The Great American Crop.

Corn or maize is the great American tillage crop. There is no other of half its area. Wheat has nearly half and cotton a quarter of its breadth. It is sufficient to cover Ohio, Indiana, and Illinois, with a slice of Iowa in addition. Its area last year, though reduced by drought, was 51 per cent of that of all cereals together, and its product was 55 per cent. It was grown by the Indians before the white man appeared on the continent. It is now grown in every State and Territory in the Union, though sparingly in those of high elevations, in the Rocky Mountain region. The supply as population increases is enlarged rather than diminished. It was 25·5 bushels per head in 1850; 26·6 in 1860; 29·7 in 1870; and 35 in 1880.

The crop, large as it is, is exported in small proportion. Only 4 per cent of the production of seventeen years has gone abroad for a market. The home market is 96 per cent of all, and its relative abundance or scarcity makes the price. If scarce, the price is high, and foreigners decline to buy; if low enough to compete with foreign feeding stuffs, a larger quantity is exported. Neither Liverpool nor Chicago makes the price, but the farmers and country feeders, who use five-sixths of all. It is a crop of which railways carry but a small part. Less than one-fifth crosses State lines. Half is used for feeding for milk or flesh, one-tenth for human food, and four-tenths for the food of working animals. For spirits scarcely one per cent is used, and yet we hear demagogues, not to say statesmen, who insist that prices would go down if the farmer was deprived of the distillery demand. The uses of corn it would be difficult to limit, in food, in drink, in clothing, in bedding, in milk, meat and wool, starch and sugar. They are so many that the lack of foreign demand for the raw grain would prove a blessing, as there is a greater profit in enlargement of its extended products. It is a raw material for manufacture which we have even less reason to import than cotton, wool, hemp, or flax, and which, like all other raw materials, should only be exported as manufactures. The prospect for the present year is for the largest area ever grown of this distinctively American crop. Aside from the area intended for grain, there will be millions of acres drilled for forage, the silo, and the summer dairy. No other plant will produce so much nutritious feed on a given area. No other is worth so much for American tillage.—*Milling World.*

Frictional Gearing.

At the recent meeting of the Institution of Mechanical Engineers, Dublin, Mr. John Purser Griffith, President of the Institution of Civil Engineers of Ireland, gave a description of the frictional gearing used on a double steam dredger in the port of Dublin.

The double steam dredger No. 4, in the Port of Dublin, was built by Messrs. Thomas Wingate & Co., of Glasgow, in 1871, and at that date was one of the largest dredgers afloat. Both sets of dredge buckets, the hoisting gear for the ladder, and the fore and aft winches, are all worked by a single-cylinder low-pressure condensing side lever engine of 150 i.h.p. It is necessary to be able at will to disconnect the gearing of either set of buckets from the main engine, or to raise the bucket ladders and warp the dredger about without driving the upper tumblers. To meet these requirements the builders adopted Robertson's grooved frictional gearing (Proceedings, 1856, page 202). Two grooved pinions of 54 in. diam., with nine grooves cut to an angle of 40° and 1¾ in. pitch, were fixed on the engine shaft, and geared into two grooved wheels of 127½ in. diam., running on intermediate shafts, but not keyed to them. Each of these wheels revolved on an eccentric gun metal bush, embracing the intermediate shaft and turning freely on it; and by means of long levers connected with the eccentric bushes the grooved wheels could be put in and out of gear with the pinions on the engine shaft. A cast iron driver keyed on the intermediate shaft was connected with the grooved wheel by a pin and sliding guide block, in such a manner as to allow of the eccentric motion; so that when the grooved wheel was thrown into gear it carried the cast iron driver around with it, and thereby turned the intermediate shaft, on which was keyed a toothed pinion gearing into the large spur wheel of the upper tumbler. Thus at will either or both of the upper tumblers could be put in and out of gear without stopping the engine. The speed of the grooved wheels at their circumference was about 500 ft. per minute. If half the engine power was transmitted by each set of gearing, and allowance be made for the friction of the engine itself, the tangential force at the rims would be about 3,690 lb., requiring, if the angle of the grooves were 40° and the coefficient of friction 0·18, a pressure of 7,615 lb. between wheel and pinion to prevent slipping. The dredger worked on the average forty-seven weeks per annum for eleven years till 1883, and raised nearly 4,500,000 tons. Some of the difficulties experienced in connection with this grooved gearing arose from variations in the hardness of the castings. As the large wheels wore down, the rim deflected between the arms, and this also caused unequal wear, which was attended by slipping of the gearing. In No. 4 dredger the pinion was wider in the face than the large wheel into which it geared, and was placed below it. The oil from the upper bearings trickled down the large wheel, and lubricated the outer grooves of the pinion. The wear and tear of these outer grooves was therefore less than that of the intermediate grooves. This led to their having a greater share of the pressure than the central grooves, and resulted in the outer faces bursting off. In addition to the mere angle, the form of the groove is an important feature in grooved gearing. When wheels of unequal diameters work into each other, it must be borne in mind that the small wheel will wear faster than the large; and the shape of the grooves in both wheels should be such that they will remain similar in shape till the tops of the ridges begin to touch the bottoms of the grooves. As soon as this point is reached, the wheels must of course be re-turned or renewed. In 1885 and 1886 the dredger was repaired, and spur gear with brake wheels substituted. In place of the grooved pinion and wheel a toothed pinion was keyed on the engine shaft, gearing into a spur wheel which ran loose on the intermediate shaft, and to the side of the spur wheel was bolted a cast iron brake wheel. As in the original arrangement, a cast iron driver was keyed on the intermediate shaft. At each end of the driver was hinged a T-shaped lever. To the short arms of the lever were attached with adjusting screws two steel brake bands, the other ends of which were fastened in a similar manner to the corresponding T-lever at the opposite end of the driver. The steel bands thus embraced the brake wheel like a brake strap. The long arms of the T-levers were connected by tension rods with bell cranks hinged at the center of the driver; and the bell cranks were also connected with a collar sliding on the intermediate shaft and revolving with the driver.

Mr. Bindon B. Stoney said the number of buckets they were able to get over per minute with the original frictional gear was twelve. With the modified brake gear they were able to get fourteen, with a much less consumption of coal.

Mr. D. Adamson said the frictional gear was not suitable for such a machine, where the motion was so slow. Where the frictional surface was only passing through 8·3 ft. per second, it was utterly inapplicable.

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THE POLYPARIUM AMBULANS.

Dr. Korotneff, of Moscow, has just described an animal from the Philippine Sea which is causing zoologists some little trouble. The *Polyparium ambulans*—that is the name Dr. Korotneff gives the new organism—was taken by the co-director of the Franco-Russian station of Villefranche in the strait that separates the Mindanao and Billiton islands.

"When I took this animal from the trawl, it appeared to me," says he, "under the form of a glairy ball of a yellowish-gray, and of the size of a European chestnut, marked with spiral convolutions and covered with small tubercles. I isolated the body in a glass, and soon saw the convolutions unwinding, the ball changing into a sort of band of a certain thickness, each of the tubercles exhibiting a mouth-like orifice, and the entire body, to my great astonishment, beginning to climb up the sides of the glass."

In Fig. 1 the animal is represented climbing up the branches of a gorgon of the same locality. It will be seen from this figure that the surface of the *Polyparium* that is turned inwardly when rolled up is very different from the other. It is upon this surface that it moves when climbing. It somewhat recalls the ventral disk of a snail, or, better, of a climbing holothurian, and may be considered as a ventral surface. This ventral surface is marked with two longitudinal furrows that divide it into three parallel bands, one median and the two others lateral, and each being about half the width of the median. The two lateral bands are not exactly alike, so that the animal is not perfectly symmetrical. The median band is provided with transverse series of

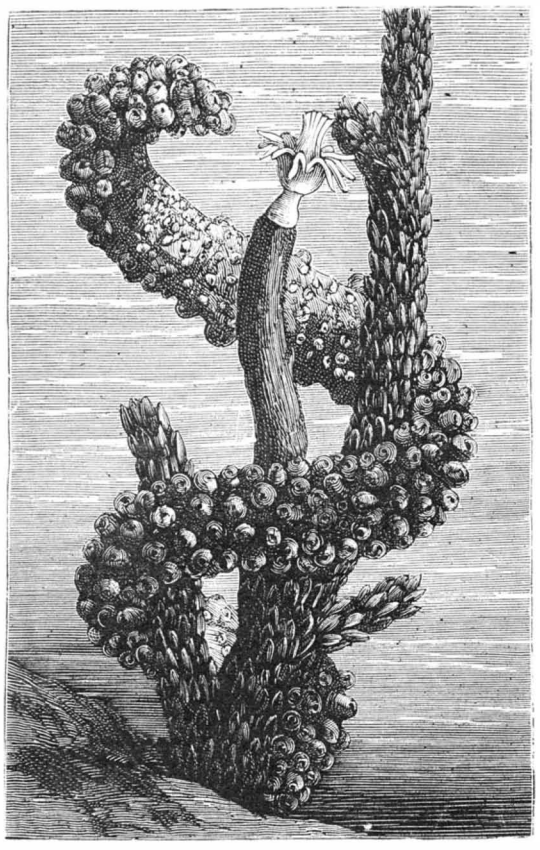

Fig. 1.—THE POLYPARIUM AMBULANS.
(TWICE NATURAL SIZE.)

suckers, each of which is placed exactly opposite one of the nearly spherical tubercles which carry the orifices of the dorsal side. This correspondence of the dorsal tubercles, *t*, and ventral suckers, *v*, is clearly seen in Fig. 2, No. 1, which represents a vertical and longitudinal section of a small portion of the *Polyparium*. In this section we remark that the band that constitutes the body of this singular organism is hollow, and that its cavity is divided into successive chambers, *l*, by transverse partitions, *c*, arranged like those that separate from each other the segments of the body of an annelid worm. But here there is an important difference. In an annelid worm the partitions that succeed one another separate chambers that resemble each other, and their two surfaces are nearly alike. Here the partitions have dissimilar surfaces, and are grouped in pairs, so as to turn their like faces toward each other and thus limit transverse chambers (Fig. 2, No. 1, *l*), that are separated from each other by empty spaces, *e*. In the chambers, *l*, the hollow tubercles open at *p*, the cavity communicating with the exterior through the intermedium of the dorsal orifices already mentioned.

Taking merely the general form of the body into account, and the regular repetition of the transverse partitions, the *Polyparium* might be considered a worm; but, if it were a worm, a digestive tube ought to pass through the partitions, and open externally in a single orifice. But that is not the case here. The digestive tube is totally wanting. It is the wall of the chambers that has to digest the food materials, and the latter can be introduced into the chambers themselves only through the intermedium of the orifices of the dorsal tubercles. Consequently these orifices must really be considered as so many mouths.

Now, in the entire animal kingdom, the sponges and polyps are the only animals in which the walls of the body perform the digestive functions, the body being thus only a sort of stomach. Despite its vermiform appearance, then, the *Polyparium* must be placed near these animals. On another hand, one well defined character distinguishes the polyps from the sponges, and that is the presence in the external layer of thin integuments of innumerable capsules filled with a venomous liquid, which a spirally wound thread, capable of untwisting at the least contact, causes to penetrate the bodies of animals exposing themselves to such contact. This is the cause of the burning sensation that the large sea anemones and medusas produce when they are touched. The wall of the *Polyparium's* body is stuffed with such stinging capsules, and the animal is, therefore, a polyp, and the structure of its body walls, minutely studied by Korotneff, assigns it a place very near the sea anemones or actinias. Here begin the difficulties.

For elementary teaching, naturalists have had the habit of selecting in the animal kingdom a certain number of types representing, for them, the fundamental forms that animals can assume. These types are, in a manner, stereotyped in their mind, and they include in them all aberrant forms, without occupying themselves about the manner in which the types themselves have been constituted. The sea anemones or actinias are just one of such types, and they serve as a starting point to explain the structure of the polyps that make up the large and important class of corallia. Dr. Korotneff then endeavored to find out how the organization of the *Polyparium* could be connected with that of the actinias, the tissues of which are here reproduced in microscopical structure. The task was not easy. A few words will suffice to explain the difficulty. In the first place, the aspect of the actinias is very different from that of the *Polyparium*. An actinia is like a stemless flower whose animate petals are arranged in numerous concentric series around a central orifice, which is the mouth. The petals of these movable flowers are called tentacles. Fig. 2 (Nos. 2 and 3) represents transverse sections through the body of two of these actinias, an *Alcyon* and a *Ceriantha*. In this figure the central ellipse, *g*, is a section of a tube open, below which succeeds the mouth, and which some consider as a stomach and others as an œsophagus. The radiating cells, *l*, comprised between the central circle and the external one, *c*, which represents the wall of the body, each forms a continuation of the tentacle. As the œsophagal tube has in general a length much less than that of the body, the partitions that separate these cells soon become free from the internal side, and the cells all open in the central cavity of the polyp's body. The same partition is common to two consecutive cells.

All this agrees but little with the organization of the *Polyparium*. Here there is no œsophagus. The cells do not communicate with a central cavity, and are, on the contrary, entirely separate from each other. Moreover, the transverse partitions, whose arrangement is so strange, are not common to two consecutive cells, but each cell has its own walls, separated by an empty space from the walls of the two contiguous cells. The difficulty may be diminished by remarking with Dr. Korotneff that the cells of sea anemones are arranged symmetrically on each side of two odd cells, as clearly shown in Fig. 2, Nos. 2 and 3, *i l*. If the œsophagal tube disappeared, and the partitions were elongated to the center of the polyp, they would necessarily meet in pairs and become united, and constitute an organism that would not be without some analogy with the *Polyparium*.

We know, on another hand, corallia, such as the meandrinas and dendrogyras, in which the cells are arranged on each side of long, sinuous galleries, on the median line of which are found numerous mouths. Dr. Korotneff thinks that the *Polyparium* is the equivalent of one of these galleries—a *Meandrina* without tentacles and with numerous mouths arranged in a large number of transverse series, instead of being arranged in a single longitudinal series. To this interpretation Mr. Ehlers opposes another. To him the tubercles of the *Polyparium* are so many tentacles provided with a mouth, and, in fact, the tentacles of some of the actinias of our coasts are perforated at the summit, and, according to Hertwig, in a certain number of deep sea actinias each tentacle is provided with a well developed mouth at the apex. The tentacle may even be abortive and the mouth alone remain, and this doubtless brings us near to the *Polyparium*.

While to Dr. Korotneff the *Polyparium* is a coralloid with numerous mouths and without tentacles, to Ehlers, on the contrary, the animal is a coralloid with perforated tentacles, but no mouth. Mr. Ehlers even asks if the animal is not a single large fragment of a deep sea actinia mutilated by a fish. The arrangement, however, of the transverse cells separated from each other by an empty space removes all foundation from such a supposition. It does not, any more than does Korotneff's theory, explain why each cell has its own walls separated from the walls of the contiguous cells, nor why several orifices correspond to the same transverse chamber. Messrs. Ehlers and Korotneff both accept the coralloid as an ideal type to which the *Polyparium* must be likened, without asking what the former itself may be.

We have already shown that the coralloid polyp is but an assemblage of simpler polyps closely united and forming an association in which the associates have divided up the roles. The central polyp alone has preserved a mouth, and it swallows and digests for its associates, which in general have no mouth, but capture the prey that the central polyp digests. They thus descend to the rank of tentacles. We have seen that it is not always thus, and that in a long series extending from the *Bunodes* to the *Liponema* each tentacle-polyp can preserve its own mouth. But this is not the only mode of association shown by these polyps. Nothing obliges them to arrange themselves in concentric circles around a central individual, and nothing obliges them to unite so exactly that their walls are confounded. In the majority of forms intermediate between the hydroid and coralloid polyps, such union does not take place, all the polyps living distinct. It is nearly so with the *Polyparium*. Here the polyps are arranged in transverse rows—an arrangement doubtless favored by the movements that determine locomotion. Each row dwells completely distinct from its neighbors, but the polyps of the same row are closely united, the walls separating them have disappeared, as have the internal walls of the cells of the coralloids, and all together no longer form anything but one and the same transverse chamber.

The close correspondence of the suckers of the ventral surface and the tubercles of the dorsal prove that it is really thus. The polyps have in this way formed an association exactly comparable to that remarkable association of bryozoa called *Cristalella*. On the whole, the tubercles are comparable to the tentacles of the corallia, as Ehlers says, and their orifices are indeed mouths, as Korotneff will have it; but the *Polyparium*, an association of hydroid polyps, like the coralloid polyp, has not presented the same mode of division of the physiological work that the latter has.—*La Nature.*

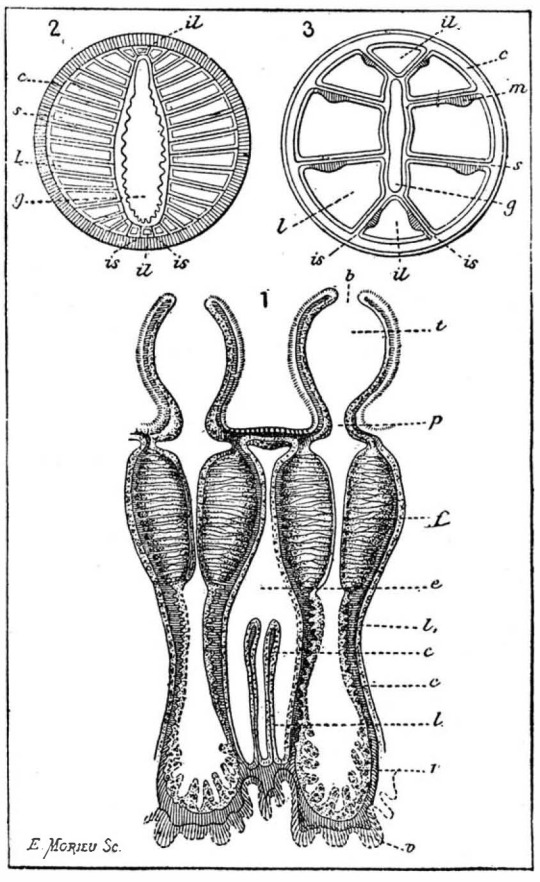

Fig. 2.

No. 1, vertical section through two cells of the polyparium: *b*, mouth; *c*, partitions; *e*, space between two cells; *l*, cavity of the transverse cells; *f*, thick transverse bands; *p*, pharynx; *t*, cavity of the tubercles; *r*, entodermic folds; *v*, sucker. No. 2, transverse section through the upper region of a sea anemone. No. 3, section through the upper region of an alcyonium: *c*, body wall; *l*, lateral cells, even and symmetrical; *i l*, odd cells; *si s*, partitions; *g*, stomachal tube.

New Army Rifles.

President Carnot, before his late journey to Upper Savoy, officially inspected the military school of St. Cyr, and the pupils, according to his request, were directed to test the rapidity of fire between the modified Gras and the regulation Lebel rifles. In the space of 30 seconds the competitors provided with the new pattern firearm had discharged 150 cartridges more than the Gras section, both the parties numbering 50 barrels each. With the magazines in action for continued fire, it was found that the Lebel could deliver double the number of shots to the Gras for an equal lapse of time. The whole of the German army is now armed with the magazine rifle, and commentators have observed that the advent of some marked advance in war equipment in the German army has always been followed by war.

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ENGINEERING INVENTIONS.

A car coupling has been patented by Mr. Jacob Rhule, of Pittsburg, Pa. This invention covers an improvement on a former patented invention of the same inventor, to adapt the coupling for use with draw heads of different lengths, and to strengthen and stiffen the draught plate and the angular brace by which it is sustained.

A guide bar for stub switches has been patented by Mr. Frank Nemacheck, of Appleton, Wis. The guide bar has a cylindrical body, with flattened apertured ends, two of them being employed with each switch rail, and so attached that the rails will be positively guided in alignment with the main rails, and the switch be prevented from clogging.

A locomotive boiler has been patented by Mr. Middleton G. Fuller, of Ten Mile Hill, S. C. This invention embraces a live steam pipe for each engine, having a throttle valve, the valves being detachably connected to a single operating lever, so that with one throttle valve the engineer is able to supply steam simultaneously to both engines, or to only one when the other engine is disabled.

AGRICULTURAL INVENTIONS.

A double shovel plow has been patented by Mr. William R. Craig, of Columbia, Tenn. This invention covers a novel construction and combination of parts constituting a double shovel plow not liable to become choked with rubbish, and of which the handles can be readily adjusted at any desired height.

A lever for sulky plows has been patented by Mr. Earl W. Drake, of Poynette, Wis. Combined with a main or lifting lever is a spring-actuated auxiliary lever pivoted to the main lever and adapted to carry the plow, whereby it is designed a sulky plow will do as good or better work in stony ground than can be done with the ordinary walking plow.

MISCELLANEOUS INVENTIONS.

A sash fastener has been patented by Mr. John F. Pool, of Mount Carmel, Ill. The invention provides for the use of catch locks on the sashes and hook catches on the window frame, making a fastening which is automatic, and dispenses with the necessity of sash weights and cords.

A gate hinge has been patented by Mr. James H. Davis, of Danville, Ky. It is a hinge adapted for a gate to be opened by a person approaching it from either side, the invention covering certain novel features of construction, making such hinges capable of more general use.

A flower stand has been patented by M. Herbert L. Starks, of Preston, Conn. This invention covers a novel construction of stand for flowers or house plants, designed to set before a window and made to revolve for more conveniently caring for the plants, the shelves being held to rotate in a free and level manner.

A combination bracket washstand has been patented by Messrs. Gayger D. Tolman and Lorenzo D. Roberts, of Shawano, Wis. It has a folding wash bowl support, consisting of a rod bent to form a circle and secured to a sleeve, with a removable pitcher shelf, and other novel features, making supports for various toilet articles.

A kitchen table and cabinet have been patented by Mary S. Brack, of El Paso, Texas. The cabinet is attached to one end of the table, and forms an integral part thereof, the whole being designed as a piece of furniture with which invalids or weak persons may accomplish considerable work without inconvenience or fatigue.

A window screen has been patented by Mr. George H. Gould, of West Lebanon, Me. This invention covers certain novel features of construction and combinations of parts in a simple and inexpensive screen, which may be quickly applied to or removed from a window frame, and is adapted to fit windows of different widths and heights.

A flash light signal has been patented by Mr. William H. Thompson, of Richmond, Va. This invention is designed to provide a simple and efficient visual signaling apparatus for use for fire alarm or police signals, and consists in a novel construction and arrangement of parts in connection with operative electrical devices.

A vehicle forms the subject of a patent issued to Mr. Wilbur H. Weston, of Newburg, N. Y. The invention consists of a carriage body having the front part of its sides inclined inward, and doors fitted on the inclined parts, making an improved vehicle, permitting easy ingress and egress, without danger of soiling the dress on the carriage wheels.

A mast hoop has been patented by Mr. Thomas Clapham, of Roslyn, N. Y. It is a detachable open mast hoop, consisting of a spring-metal rod bent upon itself to form an approximately open circle or hoop, making a hoop which can be readily attached to or detached from a sail, and the latter be conveniently unbent or bent.

A blanket clasp has been patented by Mr. Donald Walker, of Caledonia, N. Y. It is made of a piece of spring wire bent upon itself in novel form, to be quickly applied to a blanket when in position over the harness, and is designed to effectively retain the blanket in contact with the harness, without piercing or otherwise injuring either.

A mode of securing the fastenings of drilling tools has been patented by Mr. John H. Whaling, of Kingman, Kansas. This invention covers an improved form of coupling designed to prevent the accidental separation or disconnection of the tool or drill from its shaft or rod, the coupling being capable or resisting the great pressure or vibrations to which such tools are subjected.

A balance staff for watches has been patented by Mr. Charles Morlet, of Hoboken, N. J. It consists of a spindle having a shoulder or collar and with a screw thread, a roller screwing on the threaded part of the spindle and against the hub or cross bar of the balance wheel, making a simple and durable spindle for carrying the balance wheel, and facilitating an accurate and quick adjustment or removal thereof.

A combined artificial flower and perfume receptacle has been patented by Mr. Christopher Watson, of New York City. Any suitable form of bottle serves as a support for the flower structure, the petals being suitably arranged and secured by paste or glue to the sides or neck of the bottle, there being also a wrapping around the lower portion of the bottle, with moss-like fiber applied over the wrapping.

A propeller has been patented by Mr. Louis Greget, of New York City. The vessel is constructed with twin hulls, suitably spaced, combined with two series of paddles operated alternately, each series by two crank shafts, the blades of the propellers having a pitch designed to obviate back pressure, and the construction being calculated to give a high rate of speed.

A permutation lock has been patented by Messrs. Conrad A. and Svend E. Johannesen, of Erie, Pa. Combined with two dials and tumblers arranged in connection therewith, a spring plate and ratchet are arranged between the lock case and the outer dial, and an inversely arranged spring pawl plate and ratchet between the dials, with other novel features, the lock being especially applicable for use on post office boxes, as well as safes and doors.

A combined water tower, extension ladder, and fire escape has been patented by Messrs. Achilles Kalinski, Edwin Crippen, and Marcus T. Cashen, of New Orleans, La. It has telescoping pipes which carry ladders, the whole, when at place of operation, to be operated by hydraulic or pneumatic pressure or by chemical gas, the apparatus to be mounted on a truck and adapted to be run quickly to a fire either by horse or steam power.

SCIENTIFIC AMERICAN
BUILDING EDITION.

AUGUST NUMBER.—(No. 34.)

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2. Plate in colors of a fire engine house of moderate cost. Details and floor plans.
3. Perspective view and floor plans of a residence at Black Rock, Conn. Cost, six thousand dollars.
4. Sketch of an uptown block of attractive residences, New York City.
5. Floor plans and perspective elevation of two Queen Anne cottages, lately completed at Bath Beach, Long Island. Cost, four thousand dollars each.
6. Design and floor plans for a two thousand dollar house lately built at Bridgeport, Conn.
7. Perspective and floor plans of an attractive residence lately built at Bridgeport, Conn. Cost, two thousand eight hundred dollars.
8. A six hundred dollar cottage built lately at Bridgeport, Conn. Perspective and floor plans.
9. Plans and perspective view of a seaside cottage lately erected at Bath Beach, Long Island. Cost, three thousand five hundred dollars.
10. Engraving and floor plans of a neat little double house lately erected at Bridgeport, Conn., costing one thousand eight hundred dollars.
11. A country residence in France. Perspective and plans.
12. Engraving of the palatial stables of Mr. D. Edgar Crouse, Syracuse, N. Y.
13. Plans and perspective for a carriage house, barn, etc. Cost, two thousand two hundred dollars.
14. Elevation and floor plans for a double house costing complete four thousand two hundred dollars.
15. New Congregational Church at Beckenham, Kent, England.
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Miscellaneous contents: Vegetable glue.—Fourth of July fires.—The slag water closet.—Rust in water pipes.—Laying out the joints of an elliptical vault, illustrated.—The tulip and other trees.—Architectural school houses.—Hanging baskets.—To estimate the power of a stream.—Manufacturing progress in the South.—How to grow quinces.—Mixed wheats.—New ceiling for the Assembly chamber of the New York State Capitol.—Transplanting large pines.—Galveston artesian wells.—Poisonous wall paper and carpets.—The testing of Portland cement.—The humming bird.—Manila hemp in plaster.—A perfect hen house.—Examination questions for plumbers.—Road improvements.—The "Patten" metallic shingles and siding plates, illustrated.—The pool of Bethesda.—Carl Pfeiffer.—Creosote wood preserving stains.—House heating by hot water circulation, illustrated.—Ohio's largest poplar.—Mortar.—Irrigating wheels.—Liquid fish glue.

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Link Belting and Wheels. Link Belt M. Co., Chicago.

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The Holly Manufacturing Co., of Lockport, N. Y., will send their pamphlet, describing water works machinery, and containing reports of tests, on application.

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Notes & Queries

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Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(1) Locomotive Mechanic asks: 1. Will you kindly inform me what is an easy and very cheap mode of separating and collecting in quite large quantities, the oxygen from atmospheric air into covered vats or other suitable holders, and so that the remaining nitrogen, etc., may pass off into the circumambient atmosphere, or, if desired, into another holder? A. No such method is known. See Brin's process, described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 623, which we can send you for ten cents. 2. If the covered holder, thus containing the pure oxygen gas only, be sunk or rests in a tank of water, in same manner as illuminating gas in an ordinary holder, which latter rises or falls when the gas fills or empties it through pipes, would the oxygen in question escape through the water in the tank? A. Not to any appreciable extent. 3. What is the specific gravity of oxygen gas, and of atmospheric air, and of common illuminating gas, and of water, fresh and salt, respectively? A. Oxygen gas 1·10563, air the standard for gases 1·000, illuminating gas 0·425 to 0·700. Water is generally taken as a new standard for solids and liquids and is called 1,000. Then salt water of the ocean would be about 1·0274. Water is 816 times heavier than air.

(2) S. H. B. writes: I want to make transparent some thin bond paper to use for tracing drawings; is there any liquid that will do the work and not leave the paper in a greasy state? A. Equal quantities of turpentine and Canada balsam or mastic varnish, or a mixture of spirits of turpentine 6 parts, resin 1 part, boiled nut oil 1 part, by weight, may be used to make tracing paper by application with a brush or sponge.

(3) S. O. N. asks how to make platinum sponge and platinum black, and can they be purchased in market, and where. A. Platinum sponge is made by adding to a solution of platinum chloride some chloride of ammonium and an equal volume of alcohol. The precipitate is filtered out and ignited. Platinum black is made by warming platinum chloride with caustic potash and alcohol, or by dipping the platinum solution into a boiling mixture of three volumes glycerine and two volumes caustic potash solution (sp. gr. 1·08). Dealers in chemicals can supply both forms of platinum.

(4) H. P. B. asks for a formula for silvering the inside of small glass balls. A. Melt together ½ ounce lead and ½ ounce tin, immediately add ½ ounce bismuth, skim off the dross, remove from fire, and before it cools add 5 ounces mercury, and stir well. Keep in a clean glass. To use strain through a linen rag and pour into globe, and move around so as to coat its whole surface. The globe must be perfectly clean. Or, make an alloy of 3 ounces lead, 2 ounces tin, and 5 ounces bismuth. Put into globe and melt over a spirit lamp, moving the globe in all directions so as to coat the entire surface. Finally pour off the excess.

(5) F. C. L. asks: 1. In what portion of the United States are the common dust or heat whirlwinds most numerous? Where do they attain their largest size, and how large? A. In Kansas and Colorado they are most numerous and probably of greatest severity. 2. Do they ever become of dangerous or destructive strength? A. They are very destructive both of life and property. 3. Have any photographs of our tornadoes ever been taken, and if so where can they be obtained? A. For full treatment of the subject and reproductions of instantaneous photographs of tornadoes, we refer you to John P. Finley's most interesting book on "Tornadoes," which we can send you for $1.

(6) W. H.—Beeswax alone may be used for polishing handles, etc., in the lathe. It may be tempered to any degree of softness by heating with turpentine. This must be done with great care to avoid a conflagration.

(7) H. P. R. asks for a recipe for a cement to use in fastening the glass bottom in a photographer's developing dish, one that will withstand the action of chemicals. A. Use sealing wax, melted over the joints with a hot iron, and apply the glass hot.

(8) R. C. says he has negatives which have begun to crystallize. Others have an olive green color in the shadows. The crystallization is due to hyposulphite in the film, which has not been sufficiently washed out. Wash the plates in cool changing water for an hour. The olive green color may arise from the use of an old fixing bath or in not sufficiently washing out the developer. Try soaking the plates in the following:

Alum	2 oz.
Citric acid	1 oz.
Water	10 oz.

for about five or ten minutes. It may clear the shadows.

(9) E. C. R. asks: 1. If the speed of an armature is increased above its critical speed, does the current increase in quantity as well as tension? Which the most? A. The current increases in tension; its increase in quantity follows the same ratio. 2. What is the horse power of the S. E. motor, using 8 cells, plates 5 x 7? A. About one-thirtieth horse power. 3. Can I make the motor do twice as much work by supplying it with twice as many amperes of current? A. Yes, provided you do not overheat the wires. 4. I have an induction coil composed of a bundle core (No. 18 soft iron) 5½ inches long and ½ inch in diameter, which is surrounded by 4 layers of C. C. No. 22. The secondary is of 18 layers, 10 of No. 32 and 8 of No. 38, about 4,000 feet in all. The coil is 1½ inches in diameter. It is wound carefully with layers of shellac between each layer of wire. Would you please inform me from these data what size spark I can get from it? Also whether a condenser increases the size of the spark? A. The condenser increases the size of the sparks. You should get a spark ¼ to ½ inch in length. Use about 1 square foot of tin foil in your condenser. It will not be dangerous. 5. If in using the S. E. motor as a dynamo, I should turn the armature at the rate that 16 cells should turn it as a motor, would it give the quantity of current that 8 cells of the same size would give if I should use the same machine for both purposes? A. There is no necessary relation between the speeds when used as a motor and generator.

(10) F. M. D. writes: 1. I have a bicromate battery of six cells, the carbon plates are 2 x 5 in. and zincs are the same size; how large an incandescent lamp ought it to run? A. About 4 candle power. 2. Can I charge a storage battery with this battery? A. Yes. 3. Please describe how to make a

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storage battery in as simple language as possible, with dimensions of lead plates, and the time necessary to charge it. A. For storage batteries we refer you to our SUPPLEMENT, Nos. 322, 323, and others which we can send by mail for 10 cents each.

(11) C. W. asks for a recipe for making substitute for white wine vinegar; will esteem it a favor. A. Dilute acetic acid with water until of strength to suit your taste.

(12) H. Poe asks for a composition for picture frames. A. Various formulæ are used. We give two: 1. Seven pounds glue are boiled in 3½ pints water; 3 pounds white resin are dissolved in 3 pints raw linseed oil by heat. Mix solutions and simmer for ½ hour carefully. Add enough whiting. 2. Three parts Flanders glue and 1 part isinglass, make into thin glue, dissolving each kind separately and mixing and straining. Mix with sawdust after cooling and reheating. Oil the moulds before introducing the composition.

(13) J. H. asks: 1. To what extent must I enlarge the motor described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 641, to run a small skiff, also what battery to use? The probable cost of such, and running expense. A. Enlarge it to twice the size, linear. Use a 16 cell plunging bichromate battery. Cost probably from $50 to $60. Cost per cell per hour to run, about two and one-half cents. 2. Size of a two-blade propeller wheel for skiff. A. Eight inch. 3. Can all wire used in connection with motor be No. 18 insulated, also the No. of layers and convolutions No. 18 wire in the sections on the armature. A. Use No. 18 on armature and No. 16 on field magnet. The number of layers is given in the article referred to.

(14) J. L., Jr., asks what the specific gravity of water in a vacuum is. A. The specific gravity of water is the standard for solids and liquids and is 1.000. In a vacuum it will be unchanged, but the water will weigh 1-815 more than in air on account of the loss of buoyancy due to the removal of the atmosphere.

(15) A. J. W. writes: I want to know of some substance that is a complete insulator of the magnetic current, such if placed between the poles of a magnet and the armature, will not itself be attracted to the magnet nor permit the armature to be. A. As we have often said in these columns, no such substance is known, and there is not least probability of such ever being discovered.

(16) J. B. H. writes: I have been troubled lately by accumulation of lime from water passing through water front in kitchen range. The clogging is so serious that sufficient pressure was made twice to rupture inch lead pipe. Can this deposit be dissolved in any way? I learn this occurrence is not an uncommon one here. A. The water back and pipes can be partially freed from incrustation by putting in a charge of caustic soda for a day, the same as is done for steam boilers. This would be a source of much trouble and delay for a range in a house. We can only recommend putting in a new water back and cleaning the old one for future use by closing one hole and filling the water back with a solution of 1 part sulphuric acid to 4 parts water by measure; let it stand for a day or two, when the lime can be washed out.

(17) A. S.—The observed phenomenon was not a rainbow. The colored circle around the moon as seen when light fleecy or cirrus clouds are passing is properly called a halo, when very close a corona. It is caused by the refraction of the moon's light by very small particles or vesicles of water forming the clouds. In the high region in which these clouds float, the vesicles of water are sometimes in a frozen condition, and may take the various forms of minute snow flakes, and in this form may reflect the moon's light, giving rise to the white halo. To the various sizes of the water vesicles and the snow flakes is attributed the various sizes of the halos. A rainbow is always due to the combined refraction and reflection of the sun's or moon's light in falling drops of rain.

(18) F. T. R. asks: Which will produce the most horse power—two engines 12 inches in diameter and 12 inches stroke, or one engine 15¼ inches diameter 17 inches stroke, all conditions being equal? A. The one engine 15¼ inches by 17 inches will do 25 per cent more work than the other.

(19) T. E. & S. ask: What is the proper speed for a sixty inch circular saw to cut 15,000 feet of lumber per ten hours? A. The saw should have a speed of 600 revolutions per minute, for best effect. It should easily cut 15,000 feet of lumber in 10 hours with 20 horse power.

TO INVENTORS.

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INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

August 14, 1888,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Album with separable leaves, photographic, H. A. M. Dittmar 387,629
Ales and similar liquids, device for cooling, W. B. Hawkins 387,785
Aluminum bronze and other alloys, preparing, P. Heroult 387,876
Armor plates, etc., hardening and tempering, A. Evrard 387,712
Automatically-closing can, G. A. Poole 387,959, 387,960
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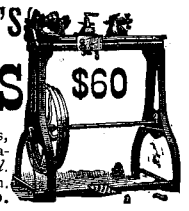

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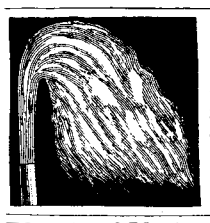

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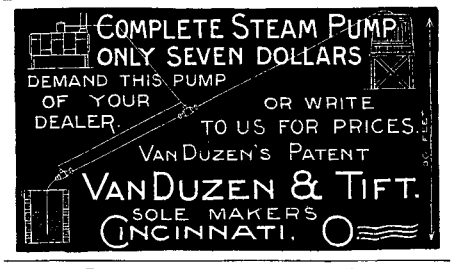

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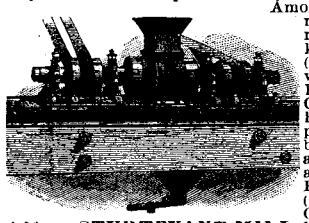

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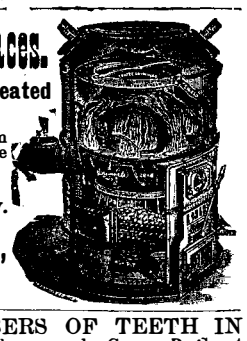

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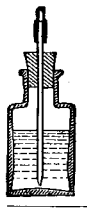

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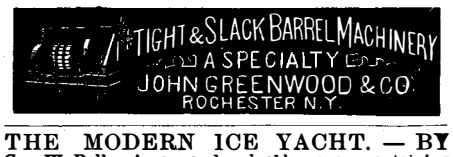

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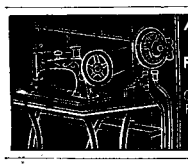
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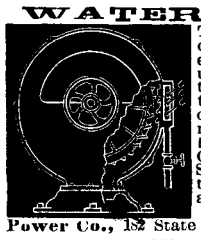
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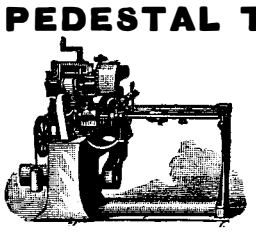
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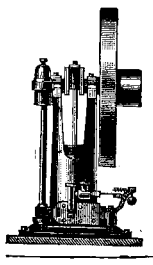
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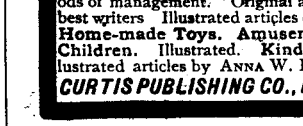
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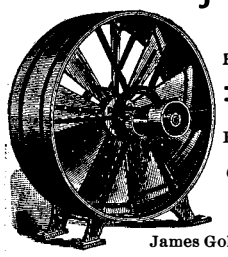
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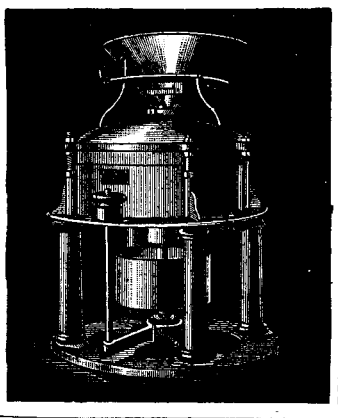
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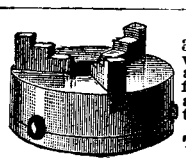
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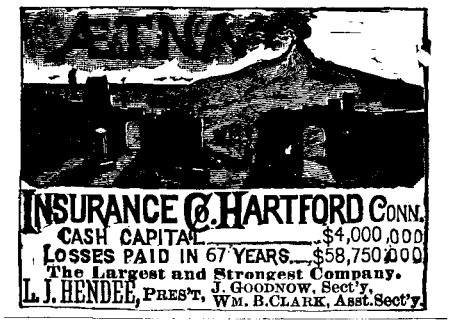
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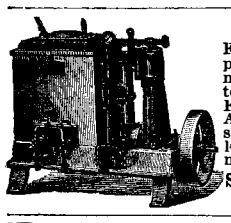
WILLIAM C. WHITNEY, *Secretary of the Navy.*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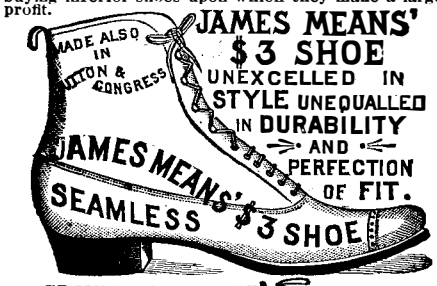
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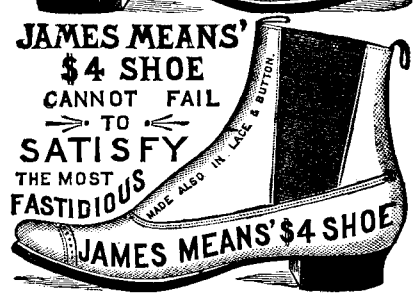

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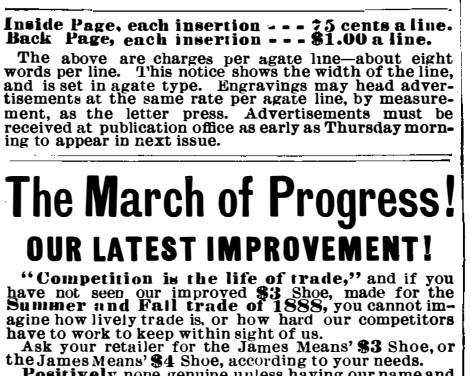

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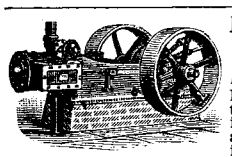

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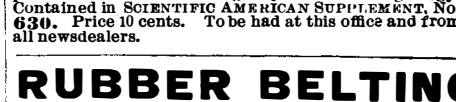

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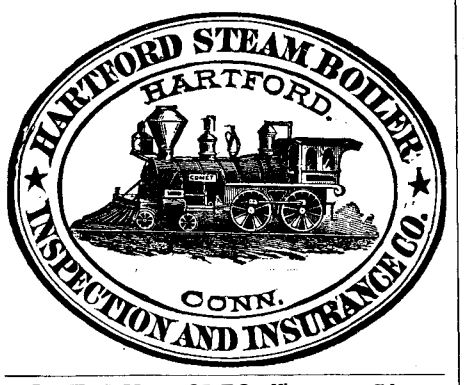

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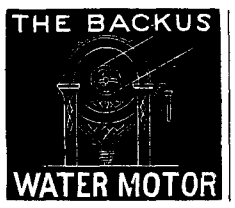

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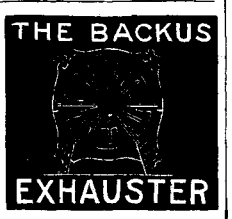

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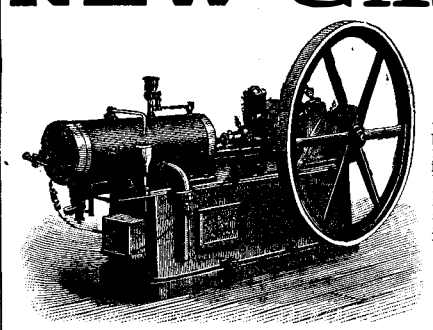

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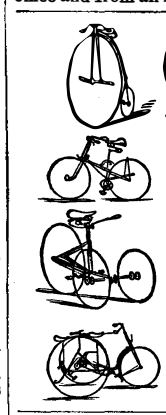

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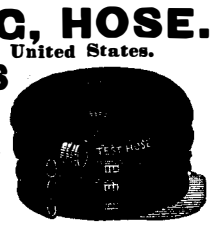

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